NATURE MAGAZINE

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Pep Up Your Meetings

Motion pictures of Nature and the Outdoors will take you far and wide in the world of the wild.

Schools; Garden Clubs; Women's Clubs; Nature and Hiking Clubs; Boy and Girl Scout Troops; Church, Civic and Fraternal Organizations; Sportsman and Conservation Groups will be interested in these motion picture films. Thrilling, educational motion pictures help to boost attendance at meetings. They make meetings more interesting and help to promote some educational activities by increasing a knowledge of Nature and the outdoors; developing a consciousness of the need for practical conservation of our national resources and the protection of wildlife.

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12. *Wild Animal Pets:* A naturalist's dog into whose life came many strange animals.
13. *Renting Houses for Songs:* An intimate study of bird life.

GROUP II: A spectacular series of Alaskan reels.

21. *Cruising North:* Murres, sea puffins, bear and other coastal wildlife.
22. *Off to Glacier Bay:* Spectacular pictures of the face of a glacier breaking off and plunging into the bay. Also wildlife scenes.
23. *Wild Animal Outposts:* Hardy Island deer, ptarmigan, bear cubs, blue fox, fur seals of the Pribilofs.
24. *Thar She Blows:* Whales at sea.
25. *Great Bear of Alaska:* Films of the great Kodiak bears of Admiralty Island.

GROUP III: Southwestern series.

31. *Wings to the South:* Bird life of the Texas Gulf coast and the southwest.
32. *Riding the Rimrock:* Searching the rough country of the southwest for its wildlife.
33. *Nature's Side Show:* The struggle for existence in the arid southwest.
34. *Queer Creatures of the Cactus Country:* A study in the adaptation of wildlife to a harsh land.
35. *Getting Personal with Mountain Lions:* A thrilling picture of a pack trip into lion country.

GROUP IV: Photographed along the Continental Divide.

41. *The Big Game Parade:* You meet Antelope, Mountain Sheep, Mule Deer, Elk, Bison, Moose, Brown Bears and Grizzlies.
42. *The Forests:* Forest Fires, Birds, Beaver—greatest conservationist of all—at work.
43. *When Mountains Call:* The life of the high places is thrilling to see. Water Ouzel, Ptarmigan, American Eagle, Big Horn Sheep, Wapiti—American cousin of the European Stag.
44. *Ramparts of the North:* Filming big game requires endurance. Glaciers, Hoary Marmot, Caribou, Moose, Black Bear.
45. *Getting Our Goat:* Mountain Goat on its native crags. Ground Squirrels, Cony, Grouse.

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Cutting loose from eastern commitments, Wally Taber has gone back to his dude ranch at Grand Lake, Colorado, at the west entrance to Rocky Mountain National Park. Beside dudes and his regular ranching activities, Wally is planning two two-week trips into the wild, exclusively for boys. He calls these Boys' Wilderness Trail Trips, the first going out the last two weeks in June, and the second the first two weeks in September. They will pack in with full outfit, a camp cook and two leaders, Wally and a graduate Yale forester. The groups are limited to fifteen boys each, and the age range is 12 to 20. Further details are available from F. Wallace Taber, Sun Valley Ranch, Grand Lake, Colorado.

Westinghouse Awards

It is interesting to note—and pleasing to us—that the two top awards in the 1947 Westinghouse Science Talent Search went this year to two young people specializing in the biological sciences. In previous years the physical sciences have largely dominated in the scholarships given. This year Martin Karplus of Newton, Massachusetts, ornithologist who plans to major in biology at Harvard and go into medical research, and Vera Radoslava Demerec of Cold Spring Harbor, New York, who has already done field collecting and preparation of animals and experimented with drosophila, and who plans to major in zoology at Swarthmore toward a career in museum work, won the four-year scholarships.

For Fishermen

With Fly, Plug and Bait. By Ray Bergman. New York, 1947. William Morrow and Company. 640 pages. Six color plates of fish lures. $5.00.

Fishermen will revel in this book by one of the leading writers on fishing in North America. Between the covers of this volume they will find a wealth of information on bait-fishing; fly-fishing for trout and bass; bait casting, spinning and trolling, and other miscellaneous information. Mr. Bergman seems to have overlooked little that the fishermen may wish to know.

Thwarting the Termites

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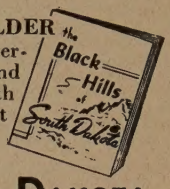

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Nature in Print

By HOWARD ZAHNISER

WHOEVER devotes much deep concern to conservation must surely come, sooner or later, to a realization that all life is one life, that the problems of conservation are aspects of a search for a more harmonious community of All-Life. It is in a community that we live (and die), and it is only as a community that we can continue to know life and to project living into an eternal future.

What is conservation as a dynamic force but an insistence on the responsibility of each to this great community? Its first self-conscious expression was in conserving living resources that men came to see were essential for human existence, and from this first expression the movement gained its name, almost by chance, yet who does not feel that the simple word-meaning of this name "conservation" is narrower indeed than the ideal? And is it not significant that this ideal, this philosophy of conservation, developed only after men and women came to realize that the real source of all life is in our far-off sun, not in ourselves, and available to us only as members of an interdependent community — an Earth-bound association of the many forms of plant and animal life that together are able to use this solar energy? Are we not slow to sense what this means in our human endeavors?

Surely, after so long a self-conscious study of Nature, after so many years trying to learn how to be conservationists, we are slow not to sense that what we are searching for is a way of living that will perpetuate all of life—for the sake of the community. I remember, not long ago, my own foolish perplexity as to whether I might better use a span of living in facilitating research to make men better fed and better clothed—or in helping to conserve a resource. Whence could such perplexity arise but from confusion in not realizing that all is one? The choice need not have seemed so profound. The decision was actually simple and personal. The profound choice is the acceptance of responsibility as a member of the life community, and that choice need not be dramatized in a perplexity over possible vocations. It is a challenge to the individual in agricultural research, or in conservation, or in education, or in any other vocation.

Nor does it seem to make much difference where the choice is made, what the scene in which responsibility is first acknowledged. We are not here to live forever but to live together, and together to perpetuate life. Who does not realize on reflection that we conservationists strive for wildlife protection, for example, because we seek a better living for ourselves and the wildlife—together? None of us is so naive as to think that we can keep a single bluebird, or deer, or wolf from ever dying—or avoid death ourselves. What we seek is good living while we are alive, and our only illusion—if we have one in our basic philosophy—is our intimation that there can be a happy way of life (till death) for all of life.

It seems to me that this search—the reward of which is Eureka also for more short-sighted seekings after simply human happiness—is the profound reason for the conservation movement, and from the conservation philosophy arises the greatest hope there has been for pursuing this quest to its goal. Conservationists, it seems to me, can fashion the key that will lock the door on much of the unhappiness we know so bitterly today.

"Deaths by actual starvation occur daily. . . . Famine is a perpetual visitor," I read in E. V. Wilcox's newly published *Acres and People: The Eternal Problem of China and India*. I read T. Swann Harding's *Two Blades of Grass: A History of Scientific Development in the U. S. Department of Agriculture*, and I realize how surely men and women who have pointedly studied Nature in this great institution have fashioned a key to lock the door on this "perpetual visitor." Then I read Ivan Ray Tannehill's *Drought: Its Causes and Effects*, and I am amazed to find the knowledge there is organized to help understand this phenomenon, which my author says "lies at the bottom of most famines."

But on the facing page I also read:

". . . it is characteristic of the American people that we like to cross our bridges only when we come to them. In times of heavy rainfall we talk of flood control and in times of drought we talk of soil conservation. We worry about emergencies and forget them as soon as they have passed on."

My impulse becomes evangelical rather than critical. I am a conservationist, not a reviewer. I wish to urge, not simply to report.

I realize it is important to point out that Dr. Wilcox has written a vivid and provocative report of conditions that he has not only contemplated in literature but which he has also seen as a traveler, and that in considering "the question of balancing acres and people" in the world's most crowded countries he has given his readers a wealth of incident and particulars. I know, too, that readers have a right to learn that Dr. Harding's history is alive with the vitality of the individual men and women who have made its research that T. Swann Harding has himself lived and worked with these men and women, and that he has been most diligent in showing how this research has produced "practical" results that mean dollars and cents to all of us. (How fortunate we Americans are when we can so easily ignore the better feeding and clothing of ourselves that are the real results of such finding and indulge rather in counting our added dollars and cents!) I am aware also that I must not fail to characterize this challenging work on *Drought* as a comprehensive, easily read summary of many studies, illustrated graphically, and well worth a perusal for its background knowledge alone—on such subjects, for example, as "What Makes It Rain?" or "What Makes the Ocean Cold?" As the author predicts in his foreword, this book "steps boldly into the unknown," yet well prepares its reader for its final sentence:

"Droughts are not mere chance occurrences; they are part of a physical process which can be measured and studied and predicted with increasing precision as our observations of the sun and the upper air and the oceans continue to accumulate."

Nevertheless, however respectful I may be of what my own readers may expect of me as a reporter, my most urgent impulse is to relate all these books to the responsibility I share with my readers (and all others) for learning to live together. Can we not together celebrate this study of drought and motivate it—not only to save our own crops—with a wish to make better the life we now share with those in Asia for whom

Reveries

By W. F. JENKINS

From the dawn, through the glare into sunset
There is life, but the warmth is gone,
Comes the chill with the haunting silhouette
Of the darkness creeping on.

What we are is the dawn and the twilight,
What we live is the in-between;
As we wait, like the day, for the blot of night
Let us turn to the earth serene;

Where a lingering iridescent sea
Of colors flame the sky
Of the spent-day rapt in reverie—
As the day dreams, so will I.

famine is a perpetual visitor? Can we not see how our growing two blades of grass "where but one grew before" is even a more immediate aspect of our responsibility to these perpetual hosts of starvation? We, the people of the world, are indeed able to feed us, the people of the world, and it would seem to be the primary object of the human study of Nature to accomplish such nourishment for all that none of us need sit down to our meals with the bitter sauce of the knowledge that we are eating in a world where men and women and children are starving. And surely the sauce is bitter for those of us who are convinced that right now—with the world populations we now have, with the production possibilities we can now see—we could well be undertaking a program that would provide food for all.

As far as the immediate situation is concerned, the central impulse of conservation would soon provoke a sure remedy if it were untrammeled by the selfishness of individuals (which we are constantly combatting) and if it were unbound by the still more reprehensible selfishness of nationalism.

Even beyond the remedying of an immediate emergency is the conservationist's hope for a permanence of happy living throughout our life community, and this hope is well suggested by the following paragraph, which I for one see as central in Dr. Wilcox's *Acres and People,* and which to me has been a text:

"For men as well as for nations adjustment to the soil is the only anchorage to life," writes Dr. Wilcox. And reading to myself "community of all life" where only "soil" is written, I say amen to the end: "In any civilization there comes a time when this adaptation is vital. . . . Deserts have succeeded to cities because cities forgot the soil. 'I can not believe,' exclaims the Earl of Portsmouth, 'that the Golden Age is a myth of superstition or a figment of idealists. I believe it to be a race memory, well nigh universal, of times when various peoples had achieved a way of living in harmony with nature, when they possessed the secret of partnership with the soil.' "

And is not this the harmony that conservationists are trying to compose?

Acres and People: The Eternal Problem of China and India. By Earley Vernon Wilcox. New York: Orange Judd Publishing Co., Inc. 1947. 297 pp., with 45 photographs and index. $3.

Drought: Its Causes and Effects. By Ivan Ray Tannehill. Princeton, N. J.: Princeton University Press. 1947. 264 pp., with 52 photographs, 68 maps, 57 graphs and drawings, appendices of weather records, bibliography, and index. $3.

Two Blades of Grass: A History of Scientific Development in the U. S. Department of Agriculture. By T. Swann Harding. Norman, Okla.: University of Oklahoma Press. 1947. 352 pp., with 36 photographs on 16 plates; introductory note by Secretary of Agriculture Clinton P. Anderson, and Index. $3.50.

Bird Life Histories

Life Histories of North American Jays, Crows, and Titmice. By Arthur Cleveland Bent. Washington, D. C. 1946. The Smithsonian Institution. 494 pages. Illustrated. Superintendent of Public Documents, Washington 25, D. C. $1.75.

This is Bulletin 191 of the United States National Museum, Smithsonian Institution, and the fifteenth volume in the monumental and invaluable life history series by Mr. Bent. The same general plan is followed in this volume as has prevailed in the series that started with publication of *Life Histories of North American Diving Birds* in 1919. No ornithological library is, of course, truly complete without these notable works on its shelves.

California Mammals

Mammals of California. By Lloyd Glenn Ingles. Stanford University, California. 1947. Stanford University Press. 258 pages. Illustrated. $4.00.

Ten years of study in the mountains and deserts of California laid the groundwork for this important and needed work. The result is a valuable reference book, and an introduction to the mammal life of California for the amateur. Keys make identification simple, and the range maps and photographs are further aids to the practical use of this volume. Dr. Ingles has made his species accounts comprehensive but has avoided making them complex, thus widening the appeal and usefulness of the book.

Sketching in Sonora

Sonora Sketch Book. By John Hilton. New York. 1947. The Macmillan Company. 333 pages. Illustrated by the Author. $5.00.

John Hilton is described as a semi-professional naturalist, and Nature plays an important part in this interesting and entertaining book. The author chose as a locale for his painting and scientific collecting the Mexican State of Sonora, lying just south of Arizona and across the Gulf of Mexico from Lower California. This is a wild, desert country where the natives have been little touched by civilization and adhere to many ancient ways. The natural history of the region is likewise relatively untouched. Roaming this country, Mr. Hilton gathered a vast amount of interesting material about the people and wildlife, sketching as he went. The combination of his illustrations and his entertaining text makes an outstanding book.

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Power

Mrs. H. D. Bruhn of Mendota Beach, Madison, Wisconsin, sends us the picture above. One day last fall a small hump was noted on the Bruhn family's asphalt-paved tennis court. It grew steadily until, finally, the asphalt gave way and the group of mushrooms broke through, deteriorating and collapsing a day or so after the picture was taken. They provide, however, a graphic example of the power and persistence of a growing thing, bound to carry out its destiny.

Georgia Birds

Birds of Georgia. By Earle R. Greene, William W. Griffin, Eugene P. Odum, Herbert L. Stoddard and Ivan R. Tomkins. Historial Narrative by Eugene E. Murphey. Athens, Georgia, 1945. University of Georgia Press. 112 pages.

This is a preliminary check-list and bibliography of Georgia ornithology sponsored by the Georgia Ornithological Society. It is not intended as a complete work on the birds of the State, but, rather, it is brought out in the hope that it will stimulate research in this field and provide a sound basis for future publications. Georgia does not have a complete catalog of its birds. Dr. Murphey's historical introduction is particularly interesting in summing up what has been accomplished ornithologically in Georgia, thus indicating graphically that much still needs to be done.

Depicting Animals

Animal Drawing and Painting. By Walter J. Wilwerding. New York. 1946. Watson-Guptill Publications. 147 pages. Illustrated. $6.00.

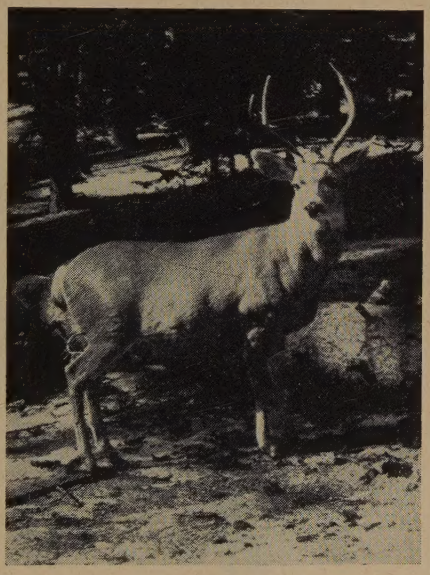
At first glance one would think of this book as appealing principally to artists or to those who aspired to draw and paint animal pictures. Actually it is much more than that. While it contains a great deal of information on methods and techniques of animal art, it also informs the layman in such a way that he can attain a greater appreciation of animal illustrations. An appendix provides pictures, biographical material and comment on several animal artists, although this section is quite incomplete and leaves one rather wishing for more material about more people.

Smithsonian Bulletins

Recent popular bulletins published by the Smithsonian Institution, Washington, D. C., include *The Importance of Plants* by William J. Robins (Publication 3829); *Growing Rubber in California* by E. L. Perry (Publication 3832); *Fungi and Modern Affairs* by J. Ramsbottom (Publication 3830); *Conserving Endangered Wildlife Species* by Hartley H. T. Jackson (Publication 3826).

Conservation Bulletin

"Conserve Our Soil, Forest and Wildlife" is the title of a splendid, concise Cornell 4-H Club Bulletin—Number 77—issued by the New York State College of Agriculture at Cornell University, Ithaca, New York. A great deal of basic information is packed into fifty pages of terse text and effective picture.



BUCK IN THE FOREST

After reading our article on "squeaking" animals, Mrs. Elinor Henry Brown of North Hollywood, California, had an opportunity to try it out in Sequoia National Park shortly after an early October snowfall. The experiment had the pictorial result pictured above, and the poetic result below:

What sound was it that made His Lordship stand
Alert, testing the snow-sharp wind for danger?
Only a whistling breath across the back of my hand,
A "squeak" that might be either friend or stranger.

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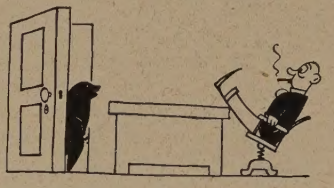
Contents Noted

WITH its gubernatorial squabbling and its outbreak of Nazi rash in the Columbians, Georgia acquiring an unsavory national reputation of which he right-minded people of the State are genuinely shamed. Now comes the regional supervisor of law nforcement of the United States Fish and Wildlife ervice with an additional indictment. Georgia gunners are the most flagrant violators of the migratory ird treaty act in existence, "the worst offenders I ave encountered in many years of game law enforcement," he says. He describes the damage done to the ourning dove population in the State as "appalling," adding that "unless we can put an early stop to he unlawful hunting there will be no game left for he law-abiding hunter." We wonder whether the outing of laws of right and reason in high places, nd by subversive minority groups, does not set the attern for gunners to justify their defiance of the aw? Law-breaking seems often to run in epidemics—o be contagious.

NEW Jersey's Department of Conservation boasts of the acceleration of its predator control program to reduce the mortality rate of wildlife." It pridelly lists the numbers of foxes, weasels, skunks, awks [no distinction as to species], opossums, horned wls, "wild woods cats," crows, red squirrels—and one nake—taken by the predator hunters. These "verin" have been taken "to reduce the dangers to rabits, pheasants and other wildlife." If these so-called redators, most of which have their proper place and efinite values in the animal community, are not also vildlife," we do not know English. The habit of assing as wildlife only those birds and mammals at provide targets for the gunners is steadily growg. It is an improper, dangerous, ignorant and speous definition.

AFTER saying some nice things about us, one of our readers, who says he is an "armchair scientist," dvances an armchair-deduced theory about volnoes. Comparing the intensity of heat generated, e terrific force liberated and the net effect of a volno with the atom bomb, this correspondent suggests that Nature may be operating her own Manhattan Project underground, manufacturing her own atom bombs, setting them off and blowing holes through the surface of the earth. Uranium, he says, may occur deep down, taking part in atomic disintegration and rearrangement until the proper formula is finally achieved, with explosive results. Somehow we rather like this theory, and fail to see why it is not as good as any other to explain volcanic origins.

REDUCTION in the numbers of the sea lion herds off the coast of California goes on despite protests and without any apparent scientific plan. No record is kept of the sex of the animals killed, and, therefore, no attempt to insure that the sea lions be only reduced rather than extirpated. The State Department of Natural Resources killed 275 sea lions in 1946, and issued several permits for the commercial capture of the animals, one permit holder taking 200. There seems to be no check made to determine whether this commercial harvesting is kept within bounds of the stated desired reduction of the herds. Fishermen can legally kill the animals if they interfere with fishing operations, and the State Department "guesses" that many are so destroyed. California conservationists are constantly frustrated by the lack of any real conservation conscience or consciousness in their State, and the sea lion fiasco is sadly typical.



OUR progress towards a state of civilized humanity seems frequently in the reverse these days, as witness the Wyoming bow and arrow bison hunt and the South Carolina goose pull. This last is a revival of an old and primitive "sport." A live goose, its neck greased and its wings free, is hung by its feet from a cross bar under which a man rides on a horse at high speed, trying, in passing, to tear the goose's head from its body. This spectacle was recently presented as an added attraction at Branchdale Racing Park near Holly Hill, South Carolina. Successive riders galloped by, grasped the neck of the bird, which was honking the while, but were unable to tear the goose apart. Finally a rider brought a mule slowly into position, grabbed the head of the bird and was lifted from the mule, but the head did not give way. After more than one thousand spectators had had their fill, the goose, tortured to death, was taken down. There were some cheers, some laughter, some evidence of distaste. This was in the U.S.A., 1947. R. W. W.

Yellow Ladyslipper

By GRACE L. MORGAN

Wilding of the forest, dancing in the glade
Or the tufted swamp lands, did an elfin maid
Lose her tiny slipper here long, long ago—
Pattern for your blossoms, bright as sunset glow?
As your cloying fragrance drifts upon the breeze,
Promises of nectar lure the roving bees,
Friendly little orchid, flower of early June
When in northern woodlands sun and earth commune.

PHOTOGRAPH OF A DOUBLE YELLOW LADYSLIPPER BY JOHN A. RAMMEL

Flowers of *Cattleya percivaliana*, a distinct species of orchid found in Venezuela. The sepals and petals are deep rose, the frilled lip is richly colored with magenta, crimson, pink and tawny yellow, while the throat is marked with crimson and gold. Not as large as some hybrids. A corsage orchid.

Orchids Are Where You Find Them

By EDNA H. EVANS

Photographs by William J. Evans

"THERE are three things we are counting on seeing," the young American couple told us as we all settled ourselves for an eight-day river boat trip up Rio Magdelena in Colombia, South America. "We want to see crocodiles, monkeys and wild orchids as big as dinner plates."

To those wishes, especially the last one, we agreed heartily. Orchids were the main reason we were in Colombia, and we also hoped to see them. More than that, we hoped to collect them and ship them Stateside by the crateful.

But it is one thing to hope, and another thing to transform hopes into reality. We realized that more and more keenly as the Magdalena's low green banks went floating by, hour after hour and day after day. We saw a number of crocodiles basking on the mud flats. We saw a captive capuchin monkey tied up to a riverside hut, and, during an expedition ashore, we heard red howler monkeys making dyspeptic noises in the distance. As for wild orchids as big as dinner plates—we did not see a single one.

This does not mean that there are no orchids in Colombia. Far from it. Colombia is one of the world's most famous orchid hunting grounds, and so is her next-door neighbor, Venezuela. But orchids, like gold, are where you find them, and frequently you find neither where you expect to.

While we are ashamed to admit it, we went to Colombia with the temperate zone resident's belief that all the American tropics are teeming with orchids, monkeys, virgin jungles, and a considerable yardage of boa constrictor thrown in for good measure. All these things exist down along the equator, but they certainly do not meet you as soon as you step off the boat or the airplane. You have to hunt for them in remote regions, in areas inaccessible except on foot or muleback. The only orchids an ordinary tourist will see in South America are those growing in special parks, or in a florist's window. And the *norteamericano* can see that much at home.

Actually, we should have known better since we had collected orchids in our home state of Florida and in the mountains of Mexico. In neither place are orchids found just anywhere. But South America seems like a far-off place. Then, too, travel books all mention the orchid vendors on every Latin American street corner. So we, too, expected to find ourselves knee-deep in orchids immediately.

As our stern-wheeler chugged stoutly up the Mag-

Laelia anceps **is sometimes considered a corsage orchid and sometimes a botanical. The pale-lavender flowers are delicate, showing up well in contrast to the more showy hybrids. It comes from Mexico.**

delena, we scanned the nearby treetops through the field glasses, searching for the first sign of orchids. During the first day there was no sign. Nor was there on the second day. But on the third day clusters of thick, lily-like leaves began to appear in the tree crotches or in patches along the rough-barked trunks. Patience must be an orchid-hunter's quality.

"Orchids!" everybody shouted joyously.

And orchids they were; or at least some of them were. Others were bromeliads—air plants whose foliage looks somewhat like the top of a pineapple. There were vines, too, and aerial ferns. Here was jungle that looked like jungle.

But closer study through the field glasses revealed disappointing things about those orchids. They were orchids, all right, but of non-commercial varieties. Their blossoms certainly were not the size of dinner plates. They were not even as big as soup spoons, and their colors would not cause the temperature of a florist to rise a single degree. In fact, they were not much better than the native orchids we were acquainted with in Florida, U. S. A.

While few people realize it, the orchid family is one of the largest in the plant world, and one that is represented in almost every part of the globe. In all, and depending on the authority consulted, there are between 15,000 and 25,000 different species of orchids. They range in size from the dinner plate model down to tiny ones with blossoms no bigger than the head of a pin. Some thrive in the tropics; others grow as far north as northern Canada. The lady's slipper is an orchid, and so is the plant from which we get vanilla extract.

From the standpoint of the collector, there are two kinds of orchids—corsage type and botanicals, or, to express it another way, commercial and non-commercial. So far as numbers go, the botanicals far outstrip the corsage producers.

There is another fact that few people realize. The dinner-plate-size flowers so prized by movie stars and debutantes rarely (if ever) come from jungle plants. The big blossoms are hybrids, generations removed from the jungle. The seeds from which they grew resulted from careful cross-pollination, and the plants are greenhouse bred and nurtured as carefully as the finest thoroughbred race

Flowers of *Stanhopea oculata* have a sweet, chocolate-like odor. They are thick and fleshy, not used for corsages. They are an ivory-white, with reddish spots, and come from Mexico.

The flower spike of this *Oncidium sphacelatum* is fully three feet long, and its inch-wide flowers number in the dozens. They are dark chestnut-brown and yellow. This orchid comes from Mexico and Guatemala.

In "captivity" orchid seeds are grown in flasks on a carefully prepared and sterilized agar medium. They grow in the bottles for about a year, when the plants are removed to grow in community pots for a year.

horse. They are no wilder than a peony or a hollyhock, and they are as far from their jungle ancestors as the American Beauty is from its wild rose forebears.

We of the North American continent are apt to forget that South American settlement is older than our own. Many towns in the southern continent were settled, the original inhabitants subdued and trade routes opened up, while our ancestors were exchanging shots with the Indians in Pennsylvania and Ohio.

Of course the orchids were not exploited as soon as the gold and emerald mines, but Colombia has long been known as a happy hunting ground for orchid collectors. And, as in all happy hunting grounds, there are limits to the amount of material collectors can take out and still have plenty for the next fellow who comes along.

The Magdalena River has for many years been the lifeline of Colombia, the only highway by which goods can travel from the Caribbean coast to the center of the country. Railroads, hundreds of miles inland, begin at the river's edge, writhe and twist up the mountains, and finally end in cities tucked away amid the towering crags. For decades, nay, centuries, travelers, explorers, traders, farmers, ranchers, engineers and oil men—representing many nationalities—have traveled the Magdalena. Many of them knew about orchids. Thus, it is easy to see why the few plants they have left in trees along the river banks are not worth taking. Their collecting grounds extend for miles inland.

These are *Cattleya* hybrids and the greenhouse-grown orchids popular for corsages. They are highly prized by florists. Flowers like these are worn by movie stars and debutantes.

To find orchids today, one must get far off the beaten track—far back in the mountains, or in *barrancas* (ravines) that have somehow or other been overlooked. Even so, the chances are twenty to one that some enterprising Indio, Mestizo or Negro has found the *barranca* before you, and has taken the best specimens elsewhere.

Some of those orchids have found their way into Colombian collections. Medellín, for example, is famous for its orchids. Everyone we talked to advised, "Go to Medellín if you want orchids." But the orchids of Medellín are tame ones, comfortably lodged in patios and greenhouses. A collector would have to take up burglary in order to get orchids from that area.

Many Colombians make a hobby of orchid growing. We found a Bogotá

This particular orchid is known to science as *Vanda coerulea*. It is a native of India and it enjoys the distinction of being the only one of the orchids that produces a blue flower. It is lovely, and has several varieties.

physician who had a charming country villa literally buried in orchid plants. They grew everywhere, in outdoor rock gardens, in hanging baskets and on tree trunks. But they, too, had been collected from the wilds and many of them looked decidedly unhappy in their new home. While the doctor may have been all right with pills and powders, he certainly knew very little about the care and feeding of orchids. We hope his patients were in better care.

In Ibagué we found a furniture maker who dealt in orchids as a sideline. On the other side of the plaza was another orchid dealer, who operated on such a large scale that thousands of plants were stacked in his patio, awaiting shipment. Yet none of these men was a real collector. The doctor probably never saw an orchid in its native habitat. The other two may have, but not to any great extent. Instead, they obtained their plants from Indians in the hills, at a few centavos apiece, and quoted them at so many pesos per leaf to buyers in the States.

Nearly every patio, be it splendid or squalid, had an orchid plant or two. Thus, with the majority of Colombianos dealing in orchids either on a commercial or a casual basis, it is not difficult to understand why the trees no longer teem with valuable orchid plants.

This Venezuelan family rounded up two cases of orchids for the author. The woman on the left sells orchid plants on Mérida's streets.

Nor are there vendors of orchids to be seen in the markets, in spite of what the travel books indicate. Markets attracted us like the sugar bowl attracts ants, but never once did we find orchid plants or flowers for sale.

"*Conoce orquídeas?*" we asked the flower women time and again. "Do you know orchids?"

"*No conoce,*" was the inevitable answer.

Then, hopefully, they indicated their wares—lilies, roses, daisies, carnations—and we would shake our heads and walk disappointedly away.

Occasionally, we would meet a street peddler with a battered-looking orchid spray or a single blossom for sale. But as for the plants from which they came—a shrug, an indistinct murmur, or a roll of the eyeballs was all the answer we were able to get. Colombia, the home of the desirable *Cattleya* genus —*C. trianae, C. superba,* and *C. dowiana,* as well as many oncidiums, odontoglossums and miltonias—does not display her wares for the casual visitor.

Not that Colombians are non-cooperative about orchids. Far from it. Everybody was interested and wanted to help—but nobody knew much about orchids in the wilds. All our leads ended up in somebody's patio or ranch, where the orchids grew tamely in pots.

We gave one Colombian taxi driver a bewildering morning while we hunted for terrestrials. He began with the mistaken idea that we were scouting for gold mines. Then, when we scrambled up and down the precipitous roadsides digging out plants, he was completely puzzled. But, once he got things figured out, he turned into an enthusiastic orchid hunter himself. Maybe we found some new species that day—maybe we did not. But we will never know. The plants fell victim to a maritime strike, and when they finally arrived in the States they were too dead and dry for identification.

In Venezuela, too, the story was much the same, and the orchid will-o'-the-wisp was just as elusive. It was always the next town on, or the one just behind the mountains in the distance, or the range beyond them, that offered orchids by the dozens.

Finally in Mérida, on Simón Bolívar's birthday, we did meet an old woman selling orchid plants. When we met her she had a single plant left in her homemade basket. But that one was enough to send our hopes soaring. Here at last was someone who actually sold orchids on the streets —the travel books were right, after all.

Our enthusiasm almost overwhelmed the old woman. But, smiling shyly and showing both of her teeth, she assured us she had many more plants at her *casa* in the country.

"Could we see them?"

"Would it be possible to get more in the forest?"

The woman assured us that everything was possible. But that, of course, was just Latin politeness. Eventually we did visit her home, where a dozen or so relatives of all ages turned out to make us welcome, and to carry the single bench—which seemed to be about the sole item of furniture—from one place to another so we could sit down whenever we felt like it.

But the family did round up two cases of orchids for us, and everybody was (Continued on page 274)

America's most primitive living native, the alligator, finds his last refuge on a farm. His bath water changed daily, fed three squares a day with a shovel, the fabled terror of the Florida swamps prospers in captivity at the St. Augustine alligator farm where a study of six thousand "domesticated" specimens has begun. This study will take a century to complete.

Primitive "steam shovel." Alligator jaw pressures, approximately measured by allowing the beasts to clamp down on test blocks, showed a vise power up to 1000 pounds in studies undertaken at the St. Augustine alligator farm.

From Swamp to Swank

By JOHN LOUDON VOLLBRECHT

Photographs by J. Carver Harris

ALMOST no one loves an alligator. Two and one-half million of them were slaughtered in the State of Florida during a period of only ten years, according to a Florida Fish Commission report of 1891. There is no record of how many millions were destroyed before that time, but in 1947, at the 434th anniversary of the white man's rule in Florida, hardly 12,000 alligators are left alive in all of the great lowland peninsula. Of these, 6000 are protected on the private reservation of the St. Augustine alligator farm.

A combination of circumstances that add up to "civilization" has waged a winning war on the wild alligator. A few 'gator hunters still scour the swamps and streams for the fast vanishing wild specimens, but the capture of an alligator of any size is front-page news today. Truck farmers are draining the central and southern Florida swamps, the alligator's last stronghold, to reclaim rich bottom land. The wild alligator today is a lean, mean and hungry creature where it survives at all. Further depredations are being made on the animals by stock farmers. Even though they know that they threaten the species with extinction, the ennobled hunters feel that they are ridding the "civilized" world of "useless monsters."

Actually, the alligator is a natural and economic asset. It preserves an historic balance of Nature. It is valuable for its fine-textured, durable hides, and, prejudice aside, is a worthwhile meat critter, long considered a delicacy by many residents of the South.

The free-roaming alligator, it is true, might be considered a criminal-at-large in modern Florida; large ones are capable of killing human beings. Still, because the 'gator is a traditional enemy of fish-destroying turtles and the ominous garfish, the Florida Fish Commission protects specimens up to four feet in length. The smaller alligators are quite harmless, but even these are being eliminated. And the big ones are "harmless" if left unmolested in their rightful kingdom of the deep swamps.

Protecting small alligators, however, is not the solution to the problem of controlling—and, at the same time, preserving—the species, because an alligator must be at least twenty-five years old and six feet long before it is able to mate. If they are to reproduce normally, six-foot specimens must be protected, too.

Because of the danger of allowing 'gators to run wild in a fast-crowding area, private sanctuaries or State-supported refuges seem to be the only solution to the problem of saving this valuable but dangerous

creature. At this writing, the St. Augustine alligator farm represents the most important project in this direction. Ths farm is owned privately by W. I. Drysdale and F. Charles Usina, America's foremost alligator farmers and outstanding authorities on the species. They are not, however, the first 'gator farmers. Joseph ("Alligator Joe") Campbell of Jacksonville, Florida, was the first, in 1891. George T. Reddington and Felix Fire of St. Augustine were also interested in protecting the alligator, and established the second such farm in 1893. Usina and Drysdale combined the collections of Campbell, Reddington and Fire in 1937.

The modern St. Augustine alligator farm is a far cry from the primeval swamps. Concrete pools, running water, landscaping, new masonry buildings, and regular scientific feeding methods provide the 'gator a "plush" environment.

Not content merely to acquire established collections, Drysdale and Usina employ professional hunters to capture wild alligators alive, usually by a hook on a long pole, which is thrust into their submarine caverns where they hibernate in winter months. Because of this effort, their farm is growing and the vanishing Americans are making a slow come-back.

A more immediate benefit of the project is a new fund of information on a little-known species. The study of captive alligators on the historically recent alligator farms, although not answering all questions about these surviving saurians, has at least proved that half of the accepted beliefs about them are unfounded.

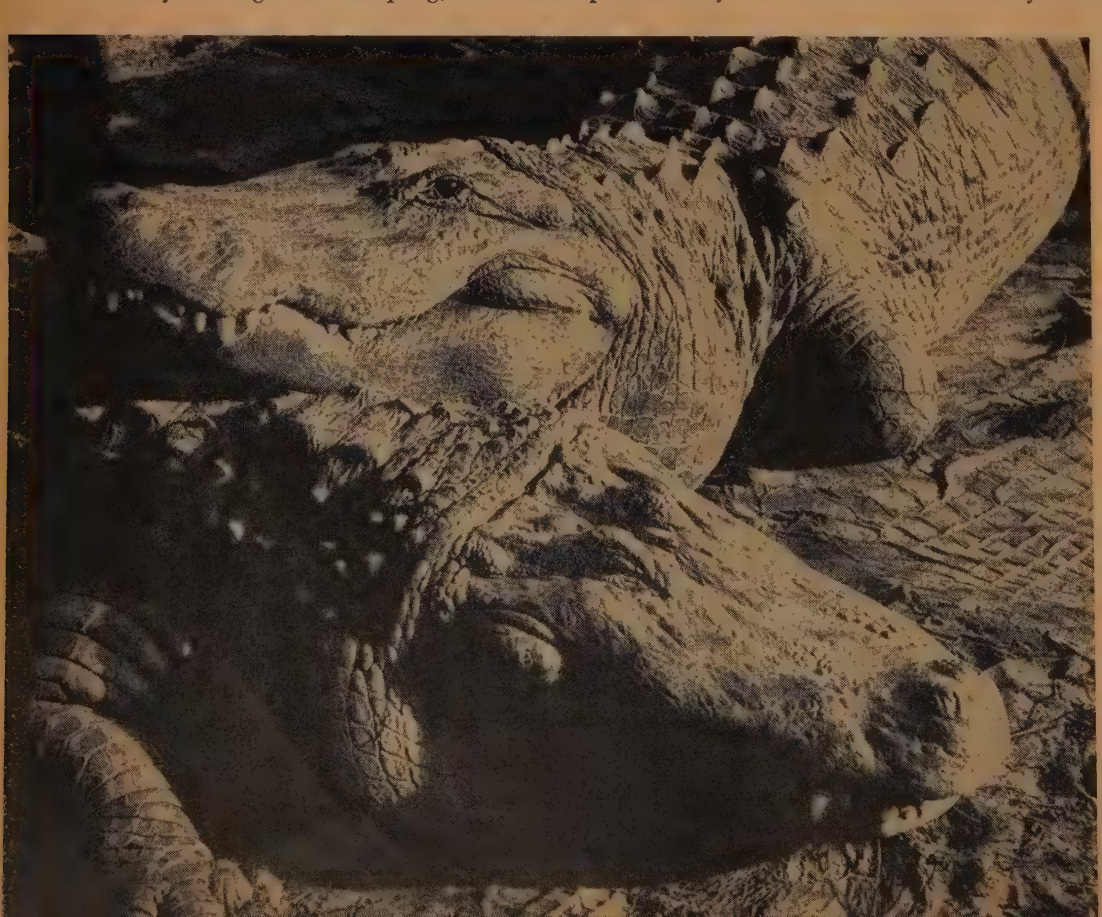
A wild deer often sickens and dies in captivity, but a wild alligator, since he prefers to spend his life merely eating and sleeping, does not particularly object to captivity as long as he is fed and not disturbed during the 95 per cent of his life in which he does not move a muscle.

References smugly state that the alligator grows an inch per year, and that his age can be judged from his size. Drysdale and Usina, among others in the field of reptile research, have tried to study an alligator's growth. They have compared growth charts with those of the late Raymond Ditmars of the Bronx Zoo, those of E. A. McIlhenny of Avery Island, Louisiana, and the charts prepared by the first alligator farmer, Joseph Campbell. Despite careful preparation, the four charts do not agree.

For one thing, alligators far outlive the human beings who would study them. Even half a century is a short span in a 'gator's long life, and half a century cannot reveal its entire story. Before 1890 there were few captive 'gators; there have been too few wild alligators tagged to give accurate figures on their growth in the natural state.

Students of alligator growth, however, have arrived at one concrete conclusion: An alligator's age cannot be judged from his size, and no two specimens exhibit the same rate of growth. The society of alligators is so strongly competitive that the law of the survival of the fittest condemns the less aggressive ones to smaller physical stature through lack of access to limited food supplies. Even in captive pens where food is plentiful, the stronger 'gators grow faster. "Take this pen full of recently hatched baby 'gators," said Drysdale, pointing to a stock of almost identical lizard-size alligators. "In two years they'll all be different sizes. The ones that get the food in the first place grow larger, and as they grow they take more and more food away from the smaller ones. The only way we can keep them from eating each other, or keep the little ones from starving, is to feed the big fellows so much food they can't stuff any more down. Then it's safe to feed the smaller specimens."

Zoological references tell us that alligators can live from a month to two years without food, but despite this remarkable talent for



"Necking." This photograph, taken during mating season, shows a male alligator (top) displaying his affection for a female. Females are distinguished by a flatter and a broader snout.

Hardly a welcome mat, a thick carpet of alligators covers the ground of the breeding enclosure of the alligator farm.

a hunger strike, the feeding of 6000 alligators at the St. Augustine farm is a major problem. Tons and tons of raw meat disappear every week, along with truckloads of fish. Dogs are banned from the reservation, because several unwary canines have vanished in a quick snap of a 'gator's jaws.

A common belief holds that alligators are fond of dogs. The fact is that they have no respect for any other creatures, either as friends or as food. They will attack and kill any kind of animal—even a skunk.

Another accepted alligator myth is that baby alligators die after hatching and come to life a few months later. What happens is that after hatching from the egg they have enough of the yolk left in their bodies to keep them alive for six or eight months. Usually hatching in late summer or early fall, they are often not strong or active enough to find food in the winter, so remain dormant until spring, "living on their fat." Hibernating alligators go without food during an entire winter. Alligators in captivity do not hibernate.

Supposition has it that an alligator gets a new set of teeth every two years. A study of saurian dentures at St. Augustine established two facts: There is no "period" whatever in dental shedding and replacement; alligator teeth can be marketed commercially at $40 per pound. Each week bushels of teeth are raked up at the farm.

Sick alligators are rare, but not unheard of. Effects of injury or sickness are hardly noticeable, however, and ailments that would kill a warm-blooded animal instantly will take from a year to twenty years to get the best of a 'gator. One alligator whose top jaw had been torn away in a fight survived with only a lower jaw and sunburned his tongue. He could hardly eat or breathe, but he lived for more than a year. Wild alligators caught with hooks have lived up to eight years with the hooks imbedded in their stomachs.

Alligators are gregarious as cannibals are gregarious; they like to live among their supply of food. They eat their own eggs, they eat their young, they eat each other, and, in mass brawls, they even try to eat themselves! Planned overfeeding has minimized the cannibalistic tendencies of the Drysdale and Usina alligators.

The alligators of the Campbell, Fire and Reddington collections, having lived together more than fifty years, somehow recognize themselves as a group. Feet and tails are bitten off in occasional battles, but few complete casualties result in this group. The long-captive 'gators, however, snarl and charge viciously whenever a strange specimen is brought in from the wild.

Empirical evidence—a horde of alligators churning in their dens at the slightest presence of meat or fish —would indicate that the reptiles had a keen sense of smell, but adult alligators normally breathe only eight times per day, or once every three hours. In other words, the 'gator does not breathe often enough to smell anything in particular. The olfactory sense can be better compared with the sense a shark uses in detecting blood at a distance in water.

The most fascinating single specimen belonging to Drysdale and Usina is a red alligator, believed by the late G. Kingsley Noble of the American Museum of Natural History to be the only red alligator known. Dr. Noble's report on the maroon monster attributes the redness to erythrism, a condition in which the black pigment cells do not oxidize but remain red as at birth, all alligators having a reddish hue when hatched. Dr. William Etkin of the American Museum suggests that amphibians are all somewhat like chameleons, pituitary conditions determining their coloration. If this is true, then St. Augustine's red

A cannibal alligator moves fast for his size as he makes a lightning snap for a morsel of baby 'gator. The little fellow scrambled away. The photographer had focused his camera for a picture of the baby alligator when the big fellow came crashing in for lunch. Photographer Harris leaped out of the way, snapping the shutter almost by accident. Result—an unusual candid picture.

'gator is in the straits of a huge chameleon whose "spectroscope" broke down on red!

The New International Encyclopedia, swaying from categorical to mythical, insists that all except the swiftest bullets bounce off alligator hide. F. Charles Usina, shooting several alligators for mounting purposes, reveals that bullets piercing their bodies anywhere except in brain and nerve cells will not stop their movements. An alligator is tough enough to ignore a bullet hole, but not even a .22-calibre bullet has ever been observed to "bounce," if well aimed.

Alligators, both polygamous and polyandrous, do not congregate for mating. Males are stationary in breeding season, bellowing furiously to attract females. They must necessarily mate in the water, where one male serves from seven to eight females per season. Mating time corresponds roughly to the month of May. At this time bull 'gators can be seen pawing over the females and "necking." For eleven other months of the year the sexes among alligators show no affection for each other. In strange contrast to their long life span, the gestation period of an alligator is very brief; eggs are laid in June and July.

The lady alligator builds a nest by digging up dirt from an area of about fifteen feet, and builds a mound over a bundle of grass and weeds. The grass base, like ensilage, forms heat when wet and helps hatch the eggs. She lays from twenty to sixty eggs per season, scooping out part of the nest and placing them gently in it, using her rear legs. If the season is dry, the female goes to the nearest water, drinks as much as she can hold and then belches it up on the nest mound to keep it moist and warm.

Females share a tendency with males to eat their young, but Nature protects baby 'gators by endowing their mothers with an instinct that prompts them to remove some dirt from the nest a few days before the eggs hatch, thus making it easier for the young to dig out. Then the mother leaves the nest forever.

Alligators seldom chase (Continued on page 276)

The Toad

By ALFRED I. TOOKE

The toad, who's very muscular,
  Drinks through his epidermis.
His habits are crepuscular—
  I think that's what the term is.

In infancy he undergoes
  Peculiar metamorphoses;
Thus the inquiring schoolboy knows
  Young polliwogs from porpoises.

His Sunday-go-to-meeting name:
  Bufo lentiginosus,
Is hard to say until you try
  Monosyllabic doses.

He helps keep gardens neat and trim,
  For he is insectivorous;
While certain birds who dine on him
  In turn, are called ranivorous.

This verrucose amphibian
  Is not unprepossessing,
And we should love him all we can,
  For he is quite a blessing.

The Toad and Its Tongue

By WALKER VAN RIPER

Colorado Museum of Natural History

Photographs by the Author

When I embarked, some months ago, upon the task of photographing the tongue of the toad in action, using the technique of the high-speed flash developed by Dr. H. E. Edgerton of Massachusetts Institute of Technology, I did some preliminary toad research. I was surprised to find that not one of the hundreds of fears and beliefs that man has held concerning the toad has had to do with that remarkable feature, the tongue. Human superstition about the toad has run the gamut from evil to good, with the curious exception that the instrument by which the animal lives has been completely ignored.

My favorite toad came from the greenhouse of a friend, and let it be said that greenhouse people generally recognize the true character of the toad as a destroyer of insects and afford it the protection and encouragement it deserves. My subject proved to be a female Rocky Mountain toad, *Bufo lentiginosus woodhousei*, the common toad of Colorado and close to the typical common toad of the East. She proved to be a model pet, readily taking the meal-worms provided as food, enjoying tub and shower baths, plainly liking to have her back gently scratched, and not objecting particularly to handling.

She did not cause warts to appear on my hands, and her manner did not, so far as I could see, appear to be characterized by obsequiousness, that is, she did not *toady* to me. I doubt, also, that, given the opportunity, she would have milked a cow, robbed birds' nests and beehives, driven a dog mad, or harmed anyone with evil eye or venomous breath. However, all of these things have been believed to be normally characteristic of the toad.

Not all of the folklore, of course, has been unfavorable, for toads have been credited with ability to dissolve kidney and gallstones, dry up the dropsy, alleviate pain, and, when placed under bed or pillow, reduce the fever of typhoid. Toads have been hung by the foot in stables to guard the horses from all kinds of disease, and kept in houses to drive away rats. To this day the notion that a toad may live for ages entombed in solid rock is so widely prevalent that newspaper stories about such an event are almost commonplace. And we all remember: "Sweet are the uses of adversity which, like the toad, ugly and venomous, wears yet a precious jewel in his head."

Sorcerers and medicine men the world over have made great use of the toad, employing him in all sorts of magical curses and vows. Medicines and poisons allegedly have been extracted from his body. It is recorded that, in the early seventeenth century, a certain philosopher was condemned to be burned alive because a toad in a glass jar was found in his house, possession of the animal being proof of traffic with the devil.

Some of these superstitions are ancient and forgotten; some persist. Modern scholars hold that all folklore of this sort should be subjected to the most care-

Smugly the toad appears to wait for the snapping of the picture in which she displays the ability of her tongue.

ful examination. Sometimes the most unlikely notions are found to rest on a basis of fact, or they supply clues that point the way to things not known before.

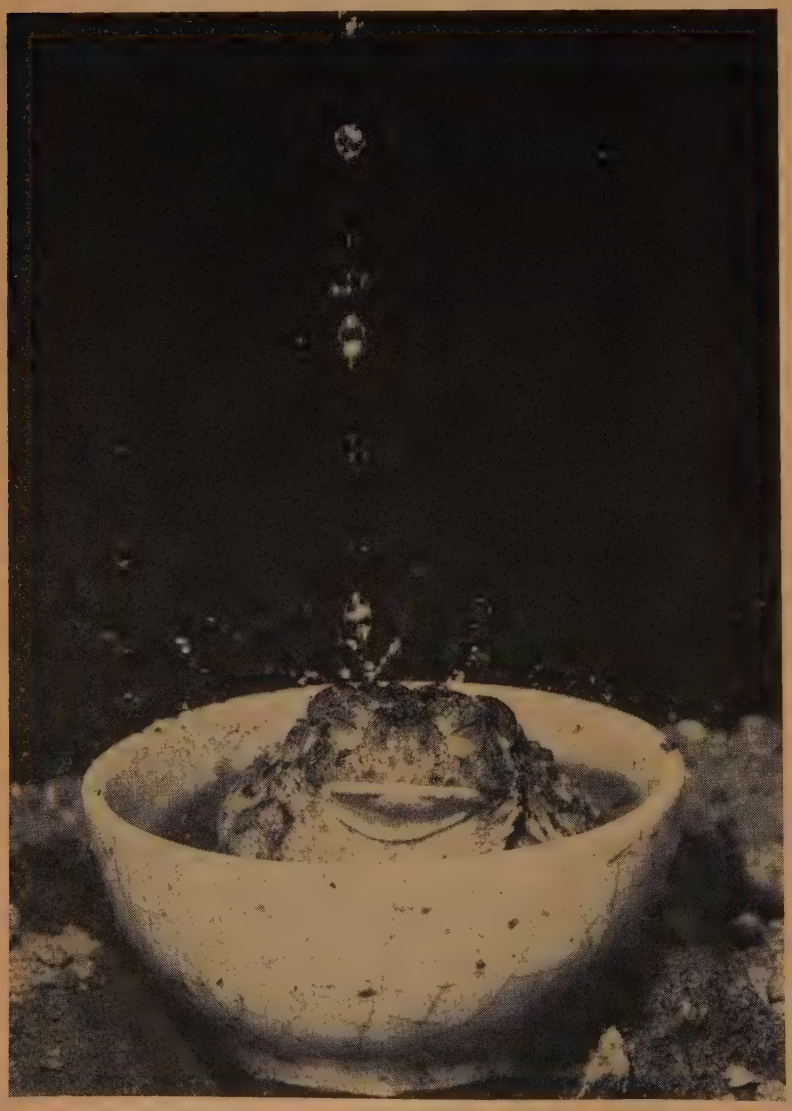
In fact, the toad has been considered thoroughly from this point of view. It has been found, for instance, that the animal does produce at least two different venoms, not harmful to man in any way, and apparently not of any great value to the toad himself. Toads also yield a substance like adrenalin, possibly having medical value, thus somewhat justifying the ancient pharmacopoeists.

The secretions of the toad do not produce warts or harm the skin of man; one secretion, however, is distasteful to dogs, and undoubtedly of protective value to the toad. This comes from the parotid gland, the large, oval swelling just behind the eye of the toad. Considerable mishandling is necessary to evoke this secretion, which has a violent effect on the mucous lining of a dog's mouth. One report, however, states that some violinists have followed the practice of handling toads before playing, as the secretions served to prevent excessive perspiration of the hands.

In our times the beliefs about the magical properties of the toad have generally declined, and in many parts of the world the little animal has come into its rightful position as the valuable ally of gardener and farmer. The toad preys upon nearly every kind of insect pest, is an enormous feeder, and is highly efficient in his predaceous activities. Slugs, cut-worms, wireworms, and the like are all meat for the toad, and it is said that a few toads will clear a garden of slugs as will no other method.

The toad is a fairly long-lived animal. One record, widely accepted, tells of a British toad kept in captivity for thirty-six years, finally succumbing violently under the attack of a pet crow. Many experiments have been made to test the widespread and persistent claim that holds that the toad may exist for a long time entombed in solid rock. This notion seems as prevalent today as it ever has been. Sound and controlled experiments agree in a clear-cut, negative result, and no competent authority now gives the slightest credence to this common belief.

There is a reliable story that explains how such a belief might have arisen. A student of toads had a number of living speci-



Enjoying the shower bath with her eyes closed. The camera stops the drops of the water as they fall.

Side view of the toad's tongue as it flicks out to gather its prey. It takes a high-speed camera to record this.

mens in his laboratory. The building was under repair, and a concrete floor was being torn up. One morning the workmen found a toad wedged down in the farthest crack under the rubble of their work of demolition. Their immediate and natural conclusion was that the toad had been walled into the concrete when it was originally laid down, and that it had been liberated by their efforts. Then the scientist appeared. One of his toads belonging to a species not found locally had escaped. In view of the fact that the toad generally tends to hunt at night and to hide away in some crack or hole or under something in the daytime, such incidents must have happened many times.

The tongue of the toad has always excited the interest and admiration of naturalists, however much the folklore-makers may have neglected it. It is this instrument that is employed exclusively in catching prey. The toad's tongue derives its efficiency from the fact that it is long and supplied with an adhesive that comes from certain glands in the mouth. Also, the tongue is based and fastened, not at the rear of the mouth as with most animals, but at the front, right behind the lower lip, and it lies with the tip pointing into the throat. In action it is flicked out with incredible speed, something like a bull-whip in the hands of an expert, and it picks up the prey and conveys it to the gullet faster than the eye can see. Thus an insect as much as four inches away (depending on the size of the toad) may be seized.

The accompanying photographs, the first to be made of this feat with the new high-speed-flash technique, show the toad's tongue in action. The flash has a duration, and thus gives an exposure, on the order of 1/30,000 of a second, fast enough to stop, photographically, even the speediest motion that any animal is capable of making.

To make the pictures, the toad, which was kept in a tub with a layer of damp earth in the bottom, was first trained to take food from a glass plate to which a brass clamp was fastened to hold the bait. The training took a little patience but was not difficult—a tribute to the animal's intelligence, which, by the way, has been verified by many experimenters and pet-keepers. Then the electrical circuit controlling the light was arranged so that the tub, earth, and toad made one side of the circuit, and the clamp holding the bait, the other, the glass plate acting as insulation between them. Thus, when the toad's tongue touched the bait, the circuit was closed and the light flashed. The procedure was to focus the camera on the bait, put the camera shutter on "bulb", and have the room in semi-darkness. Then, when the toad showed attraction to the bait and was about to seize it, the shutter was opened. When tongue touched bait, the light flashed—the film being thus exposed—and the shutter was closed. Due to the intensity of the light the lens could be stopped down to f. 22, thus giving a good depth of focus. (Continued on page 276)

Recording the rapid action of the tongue of the toad by a picture taken from a place above the actor.

Shades of Black Jack Schwartz

By RICHARD STUART PHILLIPS

A sight to bring joy to the heart of any pest hunter, the desiccated bodies of beneficial hawks rotting on a fence.

At the close of the 18th century our ancestors were well established along the eastern coast of this country. To the west of this fringe of civilization stretched an almost endless expanse of primeval wilderness of towering forests, verdant prairies, lush swamps, crystal-clear bodies of water, or tree-cloaked mountain slopes. These supported the richest array of wildlife to be found on the face of the earth. Today the forests are largely gone, many mountains stripped of their green mantles, most swamps are dry, and lakes and rivers are muddy and filled with the toxic products of pollution. The best soil from the prairies is already spreading slowly across the dark, cold ocean floor. The wildlife, despite the frantic efforts of state and national conservation workers, is a pitifully small percentage of what it once was.

If our predecessors had had the foresight to make a wise use of the land and its products, our natural resources would not now be at the dangerously low level that we find them. The extravagant burning by the settlers of much of the finest stand of hardwood trees in the world, in order to clear, as rapidly as possible, the sites for cabins and fields, is understandable. But the senseless, wanton destruction of millions of valuable mammals—not for food or for fur—but for "sport", is beyond all understanding. Sociologists tell us that the difficult life on the frontier, with all its hardships, bred strong, wise, honest, self-reliant men and women. Quite often they fail to mention that the people raised under these conditions sometimes begot cruel, bloodthirsty, thoughtless, destructive beings.

Shoemaker, writing of the early abundance of game in Pennsylvania, tells of a great animal drive organized in 1760 by a character called Black Jack Schwartz in the woods of Pennsylvania, near Pomfret Castle. There were killed in this slaughter 41 panthers, 109 wolves, 112 foxes, 114 mountain cats, 17 black bears, 1 white bear, 2 elk, 98 deer, 111 buffaloes, 3 fishers, 1 otter, 12 gluttons (wolverines), 3 beavers, and upwards of 500 smaller animals.

"The choicest hides were taken, together with buffalo tongues, and then the heap of carcasses 'as tall as the tallest trees', was heaped with rich pine and fired. This created such a stench that the settlers were compelled to vacate their cabins in the vicinity of the fort, three miles away."

They took the choicest hides, and, being such ardent, practicing conservationists, they even ate the tongues from all of the one hundred and eleven buffaloes! What a loathsome tale of senseless destruction and blood-letting. To make it even worse, this was not the first, nor even the last, of these animal drives. They continued throughout the country until, in many places, the game animals were practically extirpated. Nor was Black Jack Schwartz a central figure in the slaughter of our wildlife. He was only one in hundreds at whose feet we can lay the blame for our

The crowning achievement in a pest hunter's career of killing and maiming is to change a great-horned owl from a living, breathing, vibrant bird into a parcel of bedraggled carrion.

present wild animal scarcities.

We may be led to think that Black Jack Schwartzes and their ilk have been removed from the American scene forever. They have not. The ghosts of Black Jack and his bloody tatterdemalions still haunt our woods, skulk through our fields and thickets, and stalk through our woodlots. True, they are smaller, paler reflections of their illustrious preceptor, yet they are accomplishing the same thing—the destruction of valuable, irreplaceable species. However, they do not frankly admit to a joy in killing as did Black Jack. They attempt to hide their real purpose behind a transparent term, *pest hunt*, a fiction that implies that they are doing the farmer and the community as a whole a distinct favor. A bigger joke has never been perpetrated upon the American public.

The pest hunter's greatest satisfaction in life comes from bagging a hawk like the one above.

Who are the pest hunters? Almost anyone. People from all walks of life, businessmen, school children, farmers, factory workers, professional men. They are led by local "conservation" clubs, sportsmen's organizations, unenlightened teachers of agriculture, and conservation officers who are attempting to throw up a smoke-screen to hide the scarcity of of game animals and birds.

Attending the final meeting of a pest hunt, where the brave woodsmen get together to total the points of their bloody spoils, is, indeed, a sore experience to a true lover of Nature. Here are the tiny, bloody carcasses of several species of weed-destroying sparrows—the pest hunters will claim that they are all English sparrows. Mingled with them will be the broken bodies of grackles (protected by law) and European starlings. In another grotesque heap are stacked those "black pirates of the air," the crows. In a specially reserved spot are piled the dishevelled carcasses of red-tailed hawks, red-shouldered hawks, roughleg hawks, marsh hawks, barn owls, and even diminutive screech owls. It makes one's blood boil to see stark, visible evidence that such abject ignorance can still prevail in a supposedly enlightened civilization. One thing that is readily apparent at these tallies is the absence of such real pests as rats and mice. The reason for this is obvious. These rodents do not easily become a target for the rifle.

At times it is necessary to exercise a certain amount of control over a species, but this should never be placed in the hands of amateurs. This is a job for the experts employed by the Federal or State governments for that purpose. Interference by man in the numbers of a species is always fraught with danger. The control of English sparrows and crows can be countenanced, but many farmers have discovered, to their discomfiture, that where there is a scarcity of crows there is an overabundance of field mice. It is better for the farmer to have some young corn pulled by crows than to have the ripened ears eaten in the shock by field mice, or his fruit trees girdled during the winter months by the same rodents.

One of the most disgusting sights to a true conservationist is a hawk, or a series of hawks, hung on a fence by some pest hunter who is attempting to conserve wildlife by killing more of it. Wildlife to the pest hunter embued with the blood of old Black Jack Schwartz begins and ends with pheasants, rabbits, grouse, and quail. Anything else that walks, flies, or crawls across the countryside is vermin.

A few years ago a group of pest hunters hung one hundred and five hawks on a barbed-wire fence near my home. This sad display of the "verminers'" prowess consisted entirely of red-tailed, red-shouldered, roughleg, and marsh hawks. There they hung, one hundred and five of the world's best self-setting mousetraps. Throughout the winter and well into the spring the birds slowly rotted and disintegrated, a fitting monument to the men who acted as self-appointed executioners.

Why the farmers, who are most injured by the pest hunters, do not rise up in righteous indignation and put these shades of Black Jack Schwartz in their places is beyond all comprehension. The scientific facts are known but the pest hunter ignores them.

Bliss

By C. M. RIDDLE

Today I overheard a thrush
Telling his love in Don Mills Wood—
'Twas then I think I understood
The meaning of beatitude.

Bharal or blue sheep of Tibet adorn this stamp. Strictly high altitude animals, they graze like sheep and climb like goats. The male stands about three feet high and has horns 24 to 26 inches long. These sheep will not breed with domestic forms, maintaining their wild form.

The gom-pauuw shown on this South West African stamp eats the gum of the mimosa tree. It is a large attractive bird that may reach a length of a little more than four feet.

There are five kinds of rhinoceroses in the world, pictured on stamps of Ethiopia, North Borneo and on this stamp. They have been killed in great numbers for their horns, which were held to have healing qualities when they were crushed and taken internally.

World Tours for a Few Dollars

By ELLSWORTH D. LUMLEY

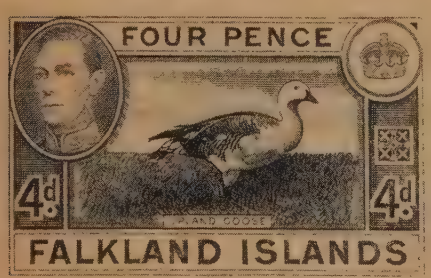
EXCEPT for short trips into Canada, and one trip to Alaska, I have never been out of the United States. Yet I have hunted for, collected and mounted such strange animals as the rhinoceros of Mozambique, the polar bear of Greenland, the eland of West Africa, and the koala of Australia. The screw-horn antelope of Somaliland and the birds of paradise of New Guinea are no stranger to me than the beaver of Canada or the bald eagle of the United States. All of this suggests I am an habitual traveler.

During the past three years I have taught zoology in high school, worked in the shipyards, grown a victory garden and have still become acquainted with such exotic birds as the teru-teru, the gom-pauuw, the kagu, and the huia. I have learned of the existence and habits of such peculiar creatures as the gaboon viper, the duiker, the chevrotain, and the Bharal sheep, I have fished for sharks in the Mediterranean, and caught sailfish in New Zealand, salmon in Newfoundland, and even fished for codfish in Iceland.

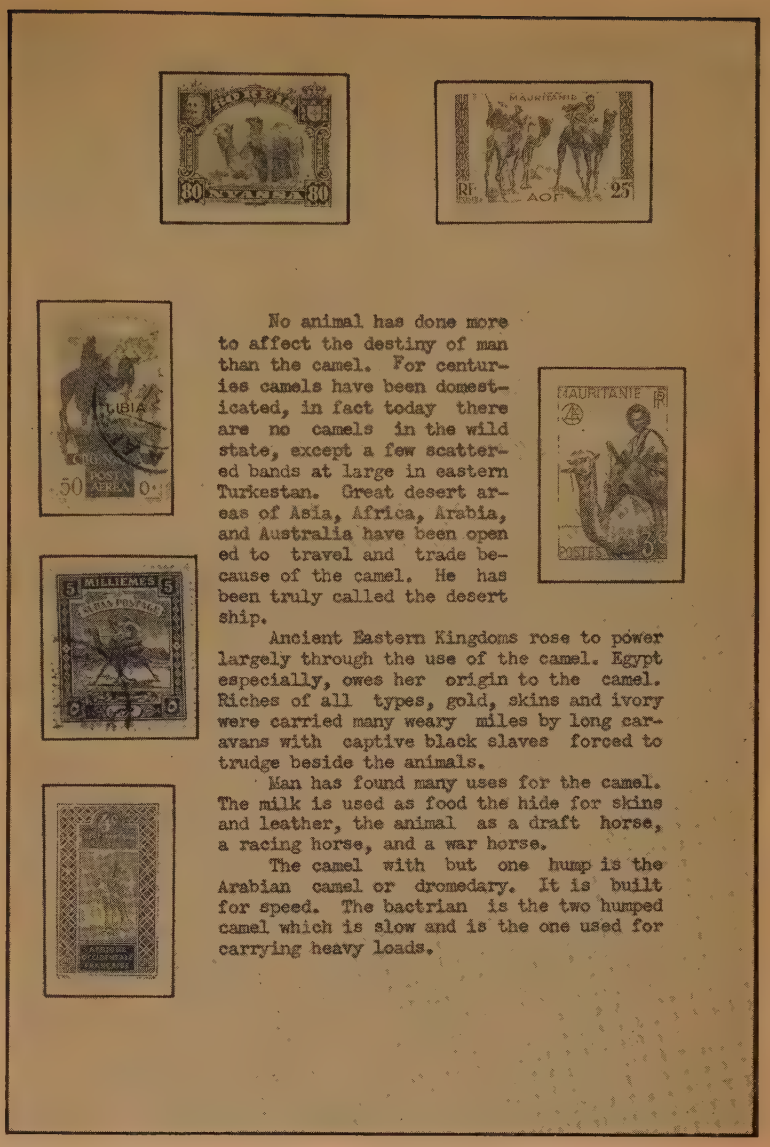
The white-shouldered duiker (left) and the water chevrotain are two of the animals pictured on Liberian stamps. The former is one of the antelopes of Africa, and the latter a small, hornless, deer-like inhabitant of the African tropics. It stands a foot high and is also known as the pigmy deer, most primitive of all deer.

The black-necked swan is a striking resident of the Falkland Islands, the most southerly of Britain's colonies. They also range over southern South America, nesting in marshes and always approaching the nest by swimming.

Another bird of the Falklands is the upland goose. Giraffes are found pictured on stamps of several countries, including the stamp at the left. They are among the gentlest of animals, and depend on speed and color for safety.



A typical page (reduced) from the author's loose-leaf album of animal stamps, through which it is possible to become acquainted with much of the world's wildlife.


No animal has done more to affect the destiny of man than the camel. For centuries camels have been domesticated, in fact today there are no camels in the wild state, except a few scattered bands at large in eastern Turkestan. Great desert areas of Asia, Africa, Arabia, and Australia have been opened to travel and trade because of the camel. He has been truly called the desert ship.
Ancient Eastern Kingdoms rose to power largely through the use of the camel. Egypt especially, owes her origin to the camel. Riches of all types, gold, skins and ivory were carried many weary miles by long caravans with captive black slaves forced to trudge beside the animals.
Man has found many uses for the camel. The milk is used as food the hide for skins and leather, the animal as a draft horse, a racing horse, and a war horse.
The camel with but one hump is the Arabian camel or dromedary. It is built for speed. The bactrian is the two humped camel which is slow and is the one used for carrying heavy loads.

Relaxation, education and inspiration have come from my hobby of animal collecting, and I have been able to take many of my students on expeditions, safaris, and treks, to acquaint them with the animals of the world. And all of this has cost me only a few dollars.

All this sounds rather fantastic, but, you see, I collect animal postage stamps. Through them much of the animal world has opened up for me and my students. When we get an animal stamp we turn to encyclopedias and animal books to read about the animal pictured. Then the stamp is mounted on a page, with what has been learned about the animal typed under the stamp. The page then goes into a loose leaf album, where it is available for inspection and study. I have made kodachrome slides of some of the stamps so that my classes can see the animals while I talk about them.

It was after I had collected a rhinoceros from Ethiopia, another from North Borneo, and still a third from Mozambique, that I learned there are five kinds of rhinoceros. The largest is from Africa, and is the second largest land animal, only the elephant being larger. It was hard to believe that this massive creature stands better than six feet at the shoulders and is more than twelve feet long. I had imagined the beast to be somewhat bigger than a large cow.

I was just as amazed when I collected my first white-shouldered duiker from Liberia, for here was a little antelope that belonged to a group some of which were no more than thirteen inches high. Both sexes have small spike horns. It was also from Liberia that I collected another miniature hoofed mammal, the water chevrotain. This tiny, deer-like animal seemed like a nymph from a fairy tale, for it would stand only slightly more than halfway to my knee. It has no horns, but the male is equipped with tusks.

While "in Africa" I found not only animals strange to me, but I also collected many with which I was

Eagles, a form of the golden eagle, are found on the stamps of Liechtenstein, some in flight. A set of five air mail stamps of this little country is probably the most beautiful set of eagle stamps. As might be expected, the polar bear appears on some of the Greenland stamps. At the right, below, two crowned cranes flank the picture of King George on the Kenya stamp.

quite familiar. The lion, elephant, hippopotamus, zebra, giraffe, chimpanzee, leopard, and gnu are only a few of them.

It was "in Europe" that I gathered up some of my old friends. The crow I got from the Netherlands, the puffin from the isle of Lundy, chickens from Bulgaria, and eagles, horses, and cows from a number of countries.

The screw-horned antelope is one member of the animal zoo pictured on the stamps of Mozambique.

Being only a school teacher I never thought I would own a chinchilla, yet I collected one from Bolivia. Also from Bolivia I got a jaguar, a toucan, and a cocoi heron. I also got several condors in Bolivia, as well as in Chile and Ecuador.

It was while I was collecting animals "in South America" that I began to understand the strange ancestry and early migration of the camels, which I had collected in such countries as Lybia, Tannu Tuva, Eritrea, Mauritania, Algeria, Nyassa, and Iraq. Camels originated in North America, but one branch of the family migrated into Asia to become our present-day camels; the other branch went southward into South America. I collected a vicuña in Bolivia. The llama and alpaca are domestic forms, the former used as a beast of burden, the latter for its wool, which is quite long and very fine. I have several llamas that I got in Peru and Bolivia.

It should also be mentioned that from Peru I collected the guanay or Peruvian cormorant, referred to as "the most valuable bird in the world." More than 9000 tons of guano are sold each year from the birds' nesting sites. It has been estimated that as many as a million dwell in a single colony.

Before I started collecting animals I am not sure that I had ever heard of the Falkland Islands. I am certain that I could not have told you where they are located, or what animals might be found on them. During the past year I have collected the black-necked swan, the upland goose, the Gentoo penguin, and the marsh ram from these islands. There are still some animals from the Falklands that I expect to get. I want the whale, the king penguin, and sea lions.

In my collecting activities I should not ignore the fact that I have become better acquainted with man, for I have found different men from all parts of the world on my stamps. In Australia I met the Yarra-yarra native, in the United States the American Indian, and in Peru the Inca courier. Along the Ivory Coast I got acquainted with a Balu belle, and in Togo saw the natives hunting. It was in Tannu Tuva that I saw the Mongols riding reindeer, and in Spanish Guinea I watched the native drummers. In the Congo I saw the native wood carvers, the basket makers, archers, rubber workers, musicians and witch doctors. In the South Pacific I met a Samoan chief and his wife and watched a native spear fish in Fiji.

Stamp collecting to some seems foolish and a waste of time. To me, and to many of my students, it has brought hours of pleasure in strange lands. We have become acquainted with animals we had never dreamed of, and have learned much more about the animals with which we had already been familiar.

Your Order, Please

By ED DEMBITZ

Wildlife can be conveniently divided into four groups with regard to eating habits: (a) plant eaters; (b) insect eaters; (c) flesh eaters; (d) eaters of both animal and vegetable food.

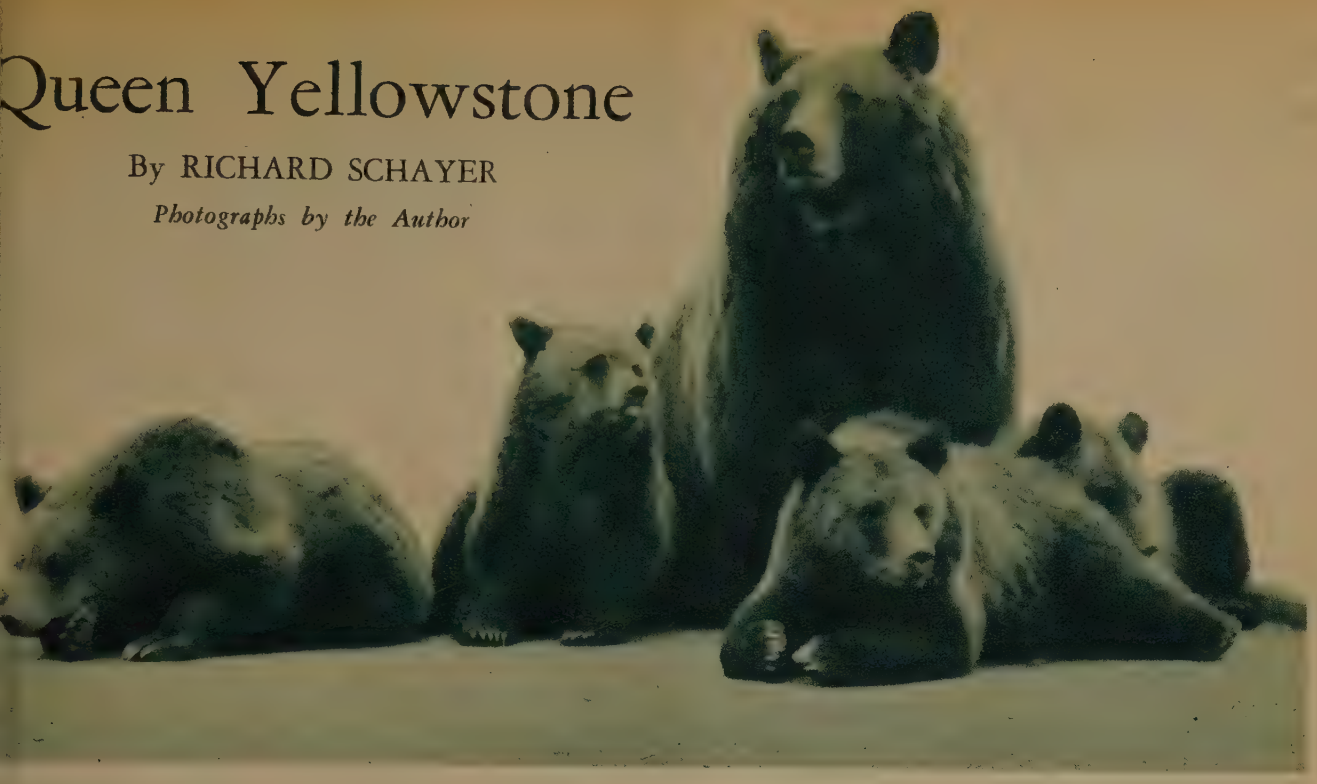
Do you know to which group each of these sixteen animals normally belongs? We say normally, because in time of famine or of unusual environment, some individual animals may change their eating habits. For the correct answers, turn to page 277.

1. badger
2. beaver
3. gray fox
4. hedgehog
5. jack rabbit
6. lynx
7. mink
8. mole
9. moose
10. opossum
11. porcupine
12. raccoon
13. skunk
14. weasel
15. woodchuck
16. bighorn

Queen Yellowstone

By RICHARD SCHAYER

Photographs by the Author



WITHIN the southern loop of the figure-eight highway that skirts the outer fringes of Yellowstone National ark and makes one crossing, is a primitive wilderness rely visited by tourists, or even by park rangers. Here re some of America's fiercest and most powerful crea-res—grizzly bears.

The famous mendicant black bears that haunted the ghway and begged from the visitors keep pretty well the northern loop. Only the biggest and most active them ever venture into the grizzly domain, and the izzlies themselves very rarely stray out of their own op. They fear and hate man and all his works, high-ays and automobiles in particular.

But for many years visitors to the park gathered every mmer evening in a strongly stockaded amphitheatre watch the rather disgusting and unnatural spectacle of a couple of dozen or so of the grizzlies snarling and snapping over the offal collected each day from the park hotels. This was brought, toward sunset, in a truck with an armed guard, and spread upon a cement platform in the clearing just before the stockade. Then the gates were unlocked and hundreds of spectators admitted to the benches on the slope within the protective barricade of logs and heavy wire fencing. The spectacle is, happily, no more. Wildlife in the National Parks is supposed to be allowed to pursue its ways with as little interference from man as possible. Garbage handouts are certainly not natural, so bear shows of this sort have been stopped, and visitors, for their own protection and for the bears' benefit, are directed to leave the animals to their own devices. So my observations take on a somewhat historic character, indeed, they represent a period in park administration history that might well be forgotten for good.

Rangers and naturalists who have studied the Park grizzlies are convinced that only a small percentage of them participated in the public banquet, and these only the older and less able specimens, and some two-year-olds just weaned by their mothers and not yet quite able to hunt down all the food they wanted. The bulk of the grizzly colony stayed back in the forest, or, like my Queen in the photographs, wandered down to the feeding grounds out of curiosity and retired to the woods at the sound of the approaching garbage truck or the sight of hundreds of humans pouring into the amphitheatre.

In July, 1937, however, I was permitted to spend an entire afternoon in the dugout behind the front parapet of the stockade, observing and photographing the gathering of the bears through a small window in the log wall. It was a most exciting and instructive excursion, as the accompanying pictures and captions will attest.

The Queen Mother grizzly emerges from the forest with her quartet of cubs, and moves sedately down toward the feeding place, apparently moved by curiosity.

Another group picture of the grizzly mother and her cubs. The moment Her Majesty heard the click of the camera she turned her head questioningly. Another camera click was all that the grizzly mother could stand. Here she pauses, mouth open, as she calls her brood to follow her away from this place of odd and dubious noises. Here, the grizzly leads her quartet across the sun-lit meadow and back into the safety of the embracing forest.

Turning the spotlight and his camera lens toward the entrance to the nesting box, Ralph E. Lawrence of Washington, D. C., obtained this splendid picture of the house wren bringing to her hungry youngsters a dainty tidbit in the form of an ant.

East Point Guard Station, high on Flattop Mountain in Columbia National Forest, southwestern Washington. In the background is Mount Adams, 12,307 feet in height, and thirteen miles away from the guard station.

Sonnets from a Lookout

BY ELLA E. CLARK

LOOKING out upon hundreds of square miles of evergreen forest, I spent two wartime summers in the Mount Adams District of the Columbia National Forest in southwestern Washington. It was my duty to keep careful watch over my immediate area, to detect, locate, and report smokes to the ranger station below me.

Majestic guardians of this region are four snow-capped peaks, from twelve to sixty miles from my lookout stations—Mount Adams, Mount St. Helens, Mount Rainier and Mount Hood. Daily companions were a few deer, among them a doe with fawn the first summer, with tiny twins the second June. A battery radio kept me informed about a war-torn world, and reminded me that others could not know the blessed serenity of my life alone on the mountain tops.

I

The sun has dropped behind St. Helen's crest;
The Cascade Range is etched with after-glow
Of rose and gold; and all the world below,
Forest and valleys, lakes and streams, now rest
Asleep among the shadows. Adams stands,
A silent guard, majestic, poised, serene;
Ageless, unchanged, it dominates the scene
For miles, watching, protecting all its lands.
Rainier and Hood, distant but close, are brushed
With pink, beneath soft clouds of deeper rose.
The air is still, the twilight calm and hushed.
My wide-eyed fawn is browsing near. Two does
And buck enjoy my salt. The bird songs cease.
I wish the warring world could know such peace!

A blacktail doe was a visitor to the vicinity of the quarters on the side of Flattop Mountain.

Mt. St. Helens as seen from Steamboat Lookout. This peak is 9,761 feet high and is at a distance of twenty miles. Fog fills the valleys below. All photographs are reproduced from original kodachromes made by Miss Clark from her post.

II

Breathless, I reached the top and gazed in awe
And wonderment. While I was at the spring,
A magic wand had transformed everything:
There, wooded slopes had been, but now I saw
A faery sea of fog. Billowing, white,
It hid the base of Adams. Rippling north,
It touched Rainier. Lesser peaks stood forth
Like islands in the foam. In great delight
I strolled along my ocean beach. My woods
Were safe that day. Beyond the westward sea,
St. Helens gleamed against the blue. Mt. Hood's
White head and Jefferson's tip rose tall and free
Far south. The sun climbed high. The beauty grew.
It was a faery world of white and blue.

III

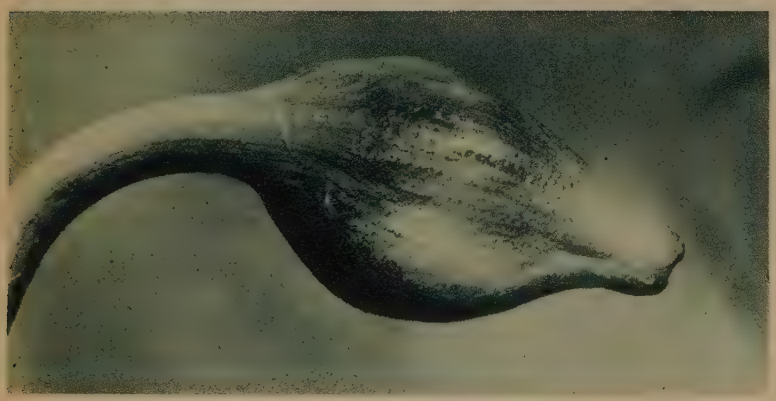
All my days are days of wonder and joy:
The wide vista widens. New peaks appear.
Strange buds unfold. Twin fawns and mother deer
Come close. No harsh or bitter words destroy
The perfect peace. No mean or petty thought
Disturbs the sweet content of daily life.
But on the air each day I heard of strife,
Destruction, torture, death, of cities brought
To ruin, people homeless, starved. I feel
The horror, ache with grief. But far away
It seems, in other worlds. Which is the real,
War or this peace? The mountains seem to say,
"Look at your forest. Real are dignity,
Life, singing gladness, grace, serenity."

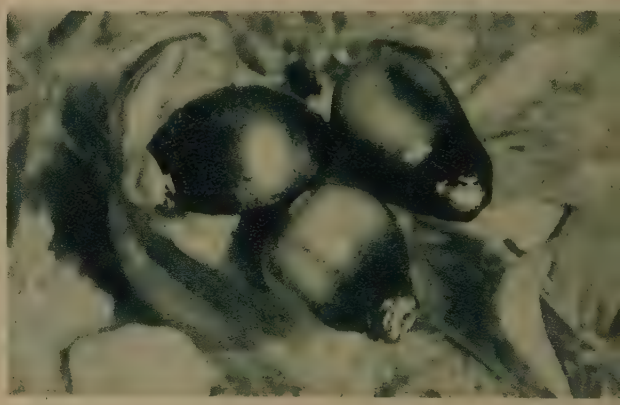
Sunset in smoke above Mt. St. Helens, as seen from the vantage point of Steamboat Lookout.

Arrowhead

Photographs by Lynwood M. Chace

ARROWHEAD belongs to the Water Plantain Family, and to the genus *Sagittaria*, which includes several species. It is a plant found at the margins of ponds and streams. Late in autumn it produces tubers that provided American Indians with food. These potato-like growths are found on long, underground runners, frequently rather far from the plant itself. They were known as *Wapatoo* by the northwestern Indians and as *Katniss* by the Algonquins. After roasting or boiling, the tubers become sweetish and good eating. In China this plant is often cultivated as a source of food, being planted near the edge of rice fields. Among the popular names often given to this plant are arrow-leaf, duck-potato and swan-potato.





At the top of the page is a typical plant of arrowhead growing in its moist or swampy habitat. The shape of the leaves indicates graphically the reason for the popular name. Above, left, is a typical seed pod of arrowhead, and above, right, are the escaped seeds from the pod floating on the water. This is the chief manner in which the seeds are distributed to other places in the natural environment of arrowhead. At the left is one of the seed pods gradually splitting open to release the seeds. Below is a pod cut to show the seed cluster.

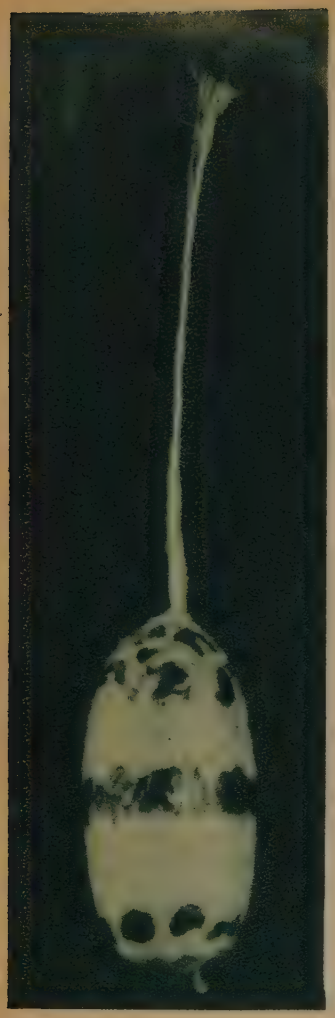
Pileated Woodpecker

By BROOKE MEANLEY

PILEATED woodpeckers are fairly common birds of the swamps and river bottoms of the Southeast, but John Hamlet and I were fortunate enough to come upon a family near the Patuxent River in Prince George's County, Maryland, in April, 1941. Spotting a freshly chiseled nest hole some thirty feet up in a river birch, we knew it immediately to be the home of this woodpecker, being

triangular-shaped instead of round, as is usual with other woodpeckers. Hiding in some nearby brush, we were confirmed in our identification when one of the big birds made a long dip to the nest hole, stopped at the entrance, looked over its shoulder and disappeared inside.

We left immediately, but were back in a few days to build bark-covered blinds at nest height in an adjacent tulip tree. Training and focusing our cameras, we ran trigger lines to an umbrella blind below and waited developments. We were able to record the comings and goings of the adults as they brought food to their young, and to photograph the ungainly youngsters—as seen here—before they left the home nest. The adults became quite accustomed to us, and we were able to bring fellow bird students for a visit. During the first week in May the young birds left, but we had come to know the family well.



Insect "cradles" are many and varied, overlooked by most people but infinitely fascinating to one with the seeing eye. Here are four such cradles, much enlarged. At the left is the tiny cocoon of an ichneumon fly, a cradle only about a quarter of an inch long, cleverly suspended by a silken cord from a twig or other support, and interestingly camouflaged. At the right is the silken bag to which a garden spider has entrusted her eggs. It is brown and inconspicuous along dead leaves and branches. Left, below, is a pod of grasshopper eggs that was expertly planted in the soil. Below, right, are mounds of white, fluffy material piled up by the cottony maple scale insect, and under which the insect deposits its eggs.

Photographs by George A. Smith

Close the Waterfowl Season

We are happy to lend our unqualified support to the request of the National Audubon Society for a closed season for migratory waterfowl in 1947. In fact, we had concluded that the situation warranted such a stand, and we were prepared to take it, had we been obliged to go it alone.

None who attended the North American Wildlife Conference in San Antonio could fail to realize that our waterfowl face a dangerous time. A meeting such as this one, made up largely of those interested in harvesting ducks and geese, or in administering this avian resource, does not spend hours considering whether waterfowl shooting is on the way out unless the skids appear to be greased.

In the mid-thirties the Federal authorities took a chance with a shortened season, when, as "Ding" Darling himself declared, "the best thing for the birds would be a closed season." Nature, not man, saved the situation, and the ducks and geese made a slow comeback. Now we are faced with plainly declining numbers of the birds, and vastly increased hunting pressure. The birds are going down at the same time that a dry weather cycle seems to be building up. We cannot take the chance again.

A closed season is the only logical course. Nature should be allowed to take over unhampered. Complete closure will be simplest of enforcement, for mere possession of wild waterfowl will be *prima facie* evidence of violation of the law.

We may expect that opposition will come from the more selfish among the hunters of ducks and geese; from certain states whose game departments largely depend for revenue upon sale of duck hunting licenses; from some sources that feel the Federal revenue from sale of migratory waterfowl hunting stamps cannot be spared. We believe that every sincere conservationist among duck hunters, as well as those interested in the birds themselves, feels that ducks and geese are more important than revenue. And the Audubon Society suggests a campaign to urge all—gunners and non-gunners—to purchase duck stamps as a contribution to restoration. We heartily endorse this suggestion and will do everything we can to further it if a closed season is ordered. And in the few principal duck hunting States the public treasury should be able to keep the wildlife departments intact.

Let us not risk our remaining migratory waterfowl in 1947. Let us tell the United States Fish and Wildlife Service that we will support it in taking a courageous stand for no shooting of ducks and geese in 1947. Let us urge the Service to prepare the duck stamp as usual, and then let us *all* lay our dollar on the line at the local post office for the stamp. Let us give Nature a chance to send back from the breeding grounds next fall flights of ducks and geese that may travel in peace and safety to the wintering grounds in the South, and return North to breed.

Buffalo Hunt—1947

Just when we think that we are making some progress toward being a civilized people, up pops something like the buffalo hunt with bow and arrow conceived by the Rawlins, Wyoming, Chamber of Commerce. The idea was that it would be great sport to line up a bunch of bow and arrow hunters, deliver buffalo by truck and drive the animals before the row of marksmen, each one shooting at the victim until it was killed.

To the credit of the National Field Archery Association let it be said that the organization condemned the idea, pointing out that the arrows could not be delivered with any hope of accuracy at seventy-five yards, the distance set. The hunt was held but proved a bloody butchery that disgusted the spectators. Each of three buffalo had to be dispatched by bullets.

What disturbs us most is the type of mind that would enthuse about such a project. First of all, the promoters selected the American bison, popularly called buffalo, an animal that belongs to America alone, and which Americans slaughtered almost to the verge of extinction. By its very persecution, the buffalo has achieved a sort of veneration—a mass desire to atone for the insensate butchery of pioneer days. The National Park Service, for example, trembled in its boots when it was found necessary to reduce a buffalo herd under Park jurisdiction, a herd that was eating itself out of habitat and could not be reduced by any other means than the culling of its numbers. Care was taken to prepare the way in advance, explain the difficult problem and obtain general agreement before one animal was eliminated.

Not so the Rawlins Chamber of Commerce. It sold a motion picture company on the idea the hunt would make an exciting motion picture. Some day the motion picture industry will discover that the great majority of movie-goers do not like to see animals killed, even by fancily-dressed gunners in the guise of sportsmen. *Life*, of course, was interested, having learned nothing from its Ohio fox hunt feature, which revealed so definitely public revulsion toward blood lust and cruelty.

We suppose that this buffalo butchery is typical of the rodeo type of mind; an attempt to typify the wide open spaces where men are men, quick on the draw, and shooting from the hip. Whatever the source and reason for such an idea, the fact remains that most Americans do not like such spectacles, and they are bad publicity for the individuals, organizations and communities involved.

PHOTOGRAPH BY THE AUTHOR

Overall view of the invertebrate section in the special exhibits house at the Brookfield Zoo in Chicago. In the left foreground is the microscope housing for tiny exhibits.

Pioneering at Chicago's Zoo

By CHARLES W. KEYSOR

PARADOXICALLY, animals without backbones form the backbone of the Chicago Zoological Park's new Special Exhibits and Demonstrations House. This public collection of invertebrates and local reptiles reveals an unappreciated strata of the animal kingdom to zoo-goers who used to think of the parks only in terms of kangaroos, monkeys and elephants.

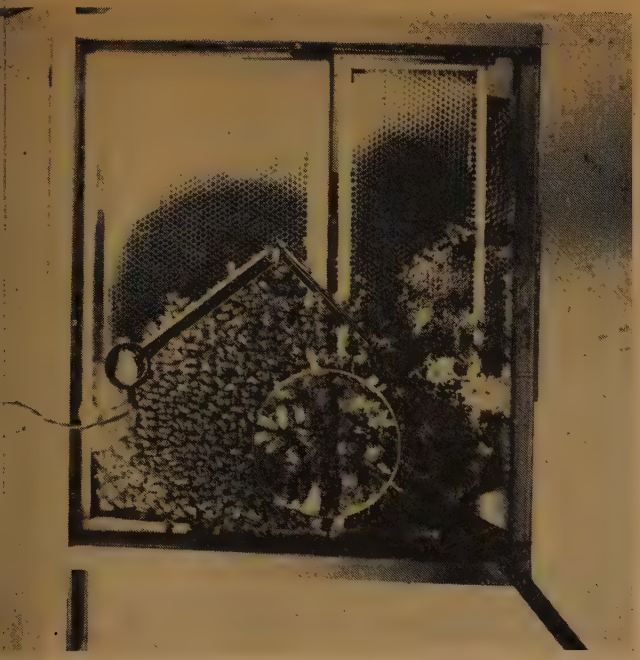
PHOTOGRAPH FROM BAUSCH AND LOMB

Visitors peer at human insect pests through the battery of five-tube microscopes. The exhibit of local reptiles and amphibians is arranged along the wall in the rear.

Approximately fifty species of invertebrates are shown to visitors, who marvel at a furry tarantula, a pale scorpion, and a Louisiana centipede, star performers of the invertebrate display. Leeches, diving beetles, and water fleas crawl or paddle about in their sand-bottomed aquariums. Antenna-waving roaches that stalk over the wire walls and ceilings of their cage draw interesting reactions from many visitors. Standing by this exhibit, you might hear: "Ooh!" or "I didn't think they grew so big," or ". . . and we never *did* get rid of them."

Gaudy silk moths and butterflies excite frank admiration from most spectators. Clamp-jawed stag beetles have reminded more than one zoo-goer of Tom Sawyer's hilarious experience with a pinch beetle in church. Praying mantids, walking sticks, locusts, and spiders fill the remaining invertebrate space along the building's west wall.

Many citizens of the invertebrate world are too small to be shown without magnification. That is why five-tube microscopes were installed in the Special Exhibits House. Under the 'scopes, many people learned that common butterfly wings are covered



PHOTOGRAPH BY THE AUTHOR

The honeybee is exhibited with a magnifying glass and a small spotlight mounted over the comb to enlarge and illumine the activities going on.

rith scales. Legs, heads, and other segments of insect natomy have also been shown, but insect pests of umans have been the most popular microscope xhibits.

Oddly enough, the public must thank a journalist or suggesting that human parasites be displayed long with the less fearsome invertebrates. Park Director Robert Bean and House Curator Robert Snediar were explaining the uncompleted Special Exibits House to a newspaperman early last Spring.

"Aren't you going to have any bedbugs"? the riter asked. "Those are the bugs people will want o see . . . in an exhibit."

The zoologists agreed that an insect exhibit without bedbugs would be as ineffective as a circus without elephants. They also recognized that insect pests perform an important natural function. Diseases transmitted by insect pests ave been a scourge to man since the beginning of recorded time. Bubonic plague, dengue fever, scrub typhus and Rocky Mountain potted fever are carried by lice, ticks, and leas.

So a scratch-provoking assortment of human parasites greeted the public when the new house opened on May 1, 1946. A "vermin vanted" advertisement in a Chicago newspaper yielded a gratifying collection of noxious insects, and attracted considerable attention to the Brookfield Zoo's newest exhibit house.

Two colonies of honeybees, living in a tall case at the north end of the building, make one of the most popular exhibits. In the summer, the bees have two transparent tunnel exits to the outdoors. The insects, which return heavily laden, almost invariably take the bottom entrance to the comb. To emphasize this activity, Curator Snedigar painted in and out arrows on the lower and upper tubes. Throughout the summer, visitors marveled that the bees were intelligent enough to follow directions!

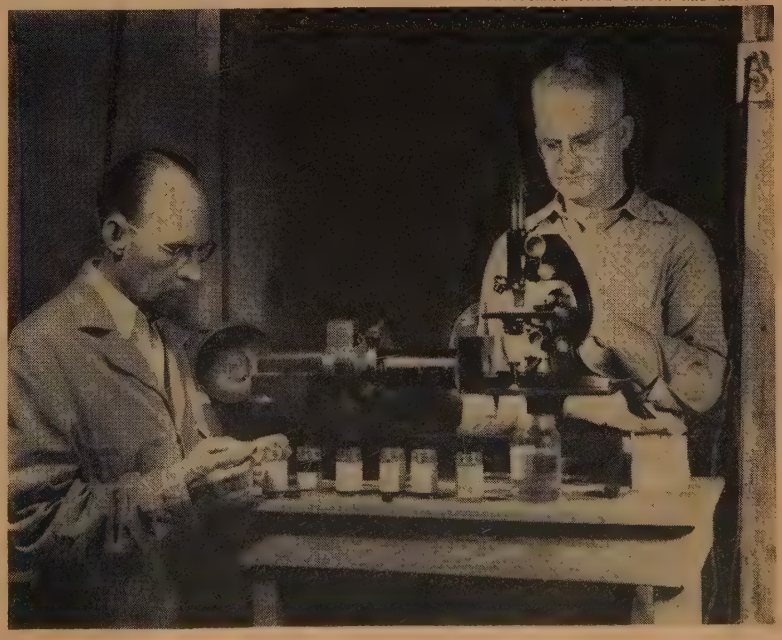
A large comb, resting against the glass, reveals the home life of the honey-makers to zoo-goers. Mounted over a spotlighted segment of the comb, a five-inch hand lens produces a wiggling enlargement of part of the hive. Curator Snedigar recalls that a veteran bee keeper spent most of one day avidly watching the queen laying eggs next to the glass.

"I've worked with bees for twenty years," the pleased visitor remarked, "but this is the first time that I've ever seen a queen in action."

The Special Exhibits House is a unique classroom for young and old. Specimens vary with the season, but the spectator always enjoys looking and learning when the lessons swim before him and come to life beneath his microscope. Mr. Snedigar's regular "World in a Waterdrop" lecture series is a highlight of the house's educational features. The talks give a kaleidoscopic view of the one-cell animal world and its relation to man. The discussion of amoeba, for instance, centers around the organism responsible for amoebic dysentary. Weird protozoan pictures, thrown by a micro-projector on the screen beside which Snedigar lectures, have captured the public fancy. Paramecium, rotifer, daphnia, euglena, hydra, vinegar eel, and mosquito larva are always shown in conjunction with the talks. When available, crayfish, leeches, blood worms, and vorticellæ are projected.

When the annual winter attendance doldrums

PHOTOGRAPH FROM BAUSCH AND LOMB



Curator Robert Snedigar (left) and William Bills prepare micro-projector cultures for the popular lecture called "The World in a Waterdrop."

settled over the park, Snedigar found time to prepare special lectures for high school biology classes. His talks to groups of visiting students correlate the exhibition material with current phases of their study. The success of his first lectures provoked a flood of requests from biology instructors throughout the Chicago area. Teachers, who can never be sure of what pupils are looking at in the school microscopes, welcome the selective illustrations provided by the micro-projector. Students enjoy a lesson in such an unusual classroom.

The story behind the Special Exhibits House is as interesting as are its unusual displays. The directors of the park had been considering an insect house since the Zoo opened in 1934. But the project remained a 'futurity' until Robert Snedigar came to the park as curator of reptiles in January, 1946. Considerable experience with capture and exhibition of reptiles and invertebrates qualified him to become curator of the new project. Under the supervision of Park Director Bean, the Special Exhibits and Demonstrations House began to take shape.

With no precedent to guide them, the planners designed their creation to inform as well as to amuse the public. The experimental nature of the project called for flexibility of exhibition material and its presentation. Consequently, displays have and will change frequently with the ideas of Bean and Snedigar, and with the availability of specimens.

The Special Exhibits House, which was converted from a huge Cracker Jack emporium, stands atop a long plaza next to the Reptile House. Its whitewashed brick walls and red tile roof reflect the overall pattern of park architecture. Upon entering the house, visitors must pause to adjust their eyes to the semi-darkness before examining the backlighted green tanks and cages, which glow warmly along three sides of the building. Crowds usually gravitate toward several large cases that contain feature exhibits. Dark benches, facing the projection screen on the back wall, serve as welcome seats where visitors can rest aching "zoo feet", or listen to Mr. Snedigar's lecture. A five-sided gray box, housing a battery of five microscopes, stands in the middle of the floor.

The striking fluorescent organic display is another "special" in the Special Exhibits House. Dr. Pough, of the American Museum of Natural History in New York, noticed that certain caterpillars produce fluorescent patterns when exposed to ultra-violet light. Bean and Snedigar determined to exhibit this phenomenon in the new house. The search for fluorescing specimens revealed that silkworm and cecropia cocoons produce the desired reaction. The eyes of leopard and bull frogs glow weirdly when placed under ultra-violet light. An ultra-violet lighting unit was installed over four small cases in a sheltered corner of the house. Ordinary lighting facilities illuminate the specimens until the spectator pushes a button on the guard rail in front of the display. Then the regular lights go out and ghostly rays bring out the fluorescent qualities of each specimen. Nowhere else can the zoo-goer find a similar exhibit.

If a new and unusually interesting small animal comes to the Brookfield Zoo, it may find itself residing in the Special Exhibits House, where facilities for effective display accent the newcomer's public appeal. That is why a Texas coral snake coils comfortably in this house. The timidity of all coral snakes makes these deadly species difficult to show off. They burrow in the cage sand, or hide beneath any object in their quarters. In keeping with the experimental nature of the new house, Mr. Snedigar decided to trick this reptile out of his exhibition fright. Working on the hypothesis that coral snakes hide because they feel secure when sand or bark is in contact with their bodies, the curator made a low platform out of celluloid and placed it next to the slab of bark under which the snake customarily hid. Soon the reptile abandoned his bark for the close-fitting transparent shelter. The bark was removed. Now the coral snake displays his beauty to all.

"Slupmiester", a grumpy armadillo, occupies a cage near the projection screen. He sulks in a corner, humping his armor-plated back to the world.

The display of local reptiles and amphibians shows that many interesting creatures live in the woods and waters of the Chicago area. Native salamanders, frogs, and newts are shown in several of their life stages. Specimens are given ratings according to their usefulness as insect exterminators. Local snakes are likewise graded on the basis of effective rodent control. Six varieties of turtles stare glumly through the aquarium glass.

The ingenuity of the men behind the Special Exhibits House gives promise of a fascinating future. Large magnifying glasses soon will be mounted on focusing tracks in front of the invertebrate cases. Imagine the appearance of (Continued on page 276)

Style Notes

By COSETTE MIDDLETON

Pale-shouldered spring might seem a little daring,
Scented with lilac and a breath of mint;
She runs barefooted on the hill-tops, wearing
A cobweb scarf, and apple-blossom print.
Summer, in daisied pinafore and socks,
With bachelor buttons in her ears, has pinned
Wistaria at her waist and four-o'-clocks,
And sweeps her hair up with a comb of wind.
Bright autumn dusts her lovely burnished back
With ragweed on a thistle powder puff,
And winter dresses sketchily in black,
With ermine anklets and a frosty muff,
While gals like me, shocked at such combinations,
Wear gardenias and slacks on all occasions.

Theodore Payne, who has given a lifetime to California's wild-flowers, stands beside a Nevin barberry in his native plant nursery. This is a rare species and Mr. Payne saved it from possible extinction after several years of failure.

Savior of Wildflowers

By GRACE V. SHARRITT

A WILD blue tree-lupine has been named for him. Four hundred species of native California wildflowers have been brought into cultivation and made available for general use through his inexhaustible patience. The Santa Barbara Botanic Garden and the exquisite garden for the California Institute of Technology at Pasadena were inspired by him. Innumerable native California plants were snatched from extinction because of the vision of this foremost wildflower seed-collector in the Golden State. Yet Theodore Payne is not satisfied with his life's work.

California's savior of wildflowers will not be content until he sees his beloved state of his adopted country dotted with wildflower sanctuaries and plant preserves from the forests of northern Humboldt County to the southern shores of the ocean near his San Fernando Valley home.

Training came early to this wildflower horticulturist. As a young English lad, from the village of Church Brampton, Northamptonshire, Theodore was happiest when working in a garden. At the age of sixteen, his parents apprenticed him to a horticultural firm at five shillings a week. This was in 1888.

When he was twenty-one, Theodore left England for America. His long journey finally brought him to Los Angeles. That was before the days of colossal Hollywood or glamorous movie queens with their palatial estates and gardens. But it was the period when the great Polish actress, Madame Helena Modjeska, was making theatrical history. Modjeska's home snuggled in beautiful Santiago canyon, Orange County, outside Los Angeles. She needed a gardener; someone with a flair for the different and the unusual. She hired the young man from Britain. He worked enthusiastically for the woman who loved beauty as did he. And it was during his sojourn of several years at her estate in the Santa Ana Mountains that his great interest in the native plants and wildflowers of California was born.

In 1903 Mr. Payne started in business for himself. His goal was to be a specialist in growing the native plants of California. At that time, less than a dozen kinds of native plants and wildflowers were obtainable in the nurseries of the state. However, he met with disappointment, for both trade and public seemed to despise the lowly wildflowers. Instead, they asked for exotics from other lands.

Undaunted, however, this man, who had unwittingly started his crusade to save California's native beauty from extinction, sowed a mixture of wildflowers in a vacant Hollywood lot. He followed this with another sowing in Pasadena. The consequent growth was so unusually lovely that it attracted wide attention, and marked the beginning of the work that Theodore Payne has accomplished today. He created a grass-root vogue, that of the native California garden, which is now taking its place in horticultural

Mr. Payne saw this desert primrose growing in a friend's garden, after the seed had been ordered from England. Inquiry proved that the seed had been shipped to England from the Payne nursery, for the native flower enthusiast had been the original promoter of this plant.

annals with the English, the Japanese, Italian and other specialized gardens.

About twelve years later Mr. Payne began to see part of his dream come true. This was the planting at Exposition Park, Los Angeles, of a garden containing nothing but California trees, shrubs and flowers. The five main groups of trees and 262 species of native plants were visited daily by thousands of people, who expressed naive, delighted surprise at the loveliness of the unusual exhibit. Those twelve years of preparatory work of educating Californians to the plant treasures of their state were adventuresome ones for the wildflower explorer. Several times he all but lost his life while collecting rare seeds from cliffs and wilderness areas. But he never lost his patience, which needed to be indestructible for the task he had set himself.

For instance there was the rare Nevin barberry, the collection of the seed of which took five years. The first year the birds got there before Mr. Payne. The next year the berries were destroyed by insects. Then two dry years followed and the bushes did not produce any fruit. The fifth year was successful and the wildflower savior collected a good supply of seed. This seed was sown carefully in the nursery, and soon several thousand little plants were potted, which later went out to all parts of California.

This rare shrub was discovered in the San Fernando Valley in 1882 by the Reverend Joseph C. Nevin, a retired missionary from China, who spent the latter years of his life botanizing in southern California. Specimens were sent to Asa Gray, who described the plant, naming it *Berberis nevinii* after its discoverer, although it is not now recognized as a valid form by *Standardized Plant Names*.

It is found nowhere else but in a small section of the San Fernando Valley, and, as a result of the rapid development of this valley in the last few years, the plant has become almost extinct. Probably less than a dozen plants are still living in the wild state. However, through the patience and persever-

Discovered by Theodore Payne, this tree lupine was named *Lupinus paynei*, in his honor.

ance of Theodore Payne, the lovely, winter, yellow-flowering shrub can be seen growing in California gardens, parks and highway plantings. And it has also found its way into English gardens.

The wildflower crusader has crawled on hands and knees in rattlesnake country to get seeds of the gem-pink gilia. After much hazardous search he found just one small, dried-up plant with a few seeds. He hoarded these like a prospector with his specks of gold. He knew that he might never find another plant, so fast were these flowers disappearing throughout the desert country. Seeds from this one small plant with the lovely pink blossoms have flowered in succeeding years in rock gardens from coast to coast.

Not only has this pioneer botanist preserved his beloved wildflowers for California, but he has packaged and sold California seeds all over the world. One day while visiting a friend in Los Angeles, Mr. Payne noted a familiar desert flower in the garden. He said, "I like your nice bed of desert primrose."

"But that's not desert primrose," his friend laughingly objected, "That seed was sent to me from England."

"Nevertheless," insisted the wildflower wizard, "that's a bed of desert primrose." Then casually, "I probably sent the original seed to England." And it proved that he had!

The tree lupine which was named for Payne by Dr. Anstruther Davidson, *Lupinus paynei*, is a native California species, and was discovered by Payne in one of his tramps for seeds in the foothills near Santa Susana. The blossoms are delicately fragrant and artistically beautiful.

Like the life of the man for whom the lupine was named, and like his dreams, the plant is symbolic of eternal growth.

To My Beauty-Loving Mother

By ESTHER LLOYD HAGG

For showing me the "diamond in the sky",
For lullabies that launched my life-long quest
In silver moon-boats, sailing calm and high
To find that "dreamland tree" where hopes are blest;
For morn's ecstatic joy in mirrored lake;
For cooling balm of woodlands' mystic ease;
For harp-chords heard where blue fringed gentians wake
And through long silken lashes make shy pleas;
For myriad delights along life's trail
You taught my ear to hear, my eyes to see
And heart to thrill me—joy can never fail
If one has beauty's wealth divinely free!
A thousand priceless gifts of vision clear!
My heart bestows its thanks, my mother dear.

Many Service Stripes

By C. M. SHIPMAN

FREQUENTLY someone asks: What is the effect of tapping a sugar maple upon the life and health of the tree? Recently I had an opportunity to answer this question. Visiting the farm where I get my annual supply of maple sugar, I found a sugar maple that had been felled for timber. There was a log with the butt end showing the part of the tree where the holes had been bored, through the years. This tree was 172 years old when cut, and thirty-two inches in diameter. Tapping had started when it was about ninety years old. New wood had filled the scars each year after tapping, and, being brown, showed that the tree had been tapped 157 times at this particular level, about breast high.

Reading the story from the annual rings, it was apparent that the tree grew slowly in its youth, probably competing with other trees. In middle life it began to grow more rapidly. Some annual rings were then three-sixteenths of an inch thick. After it reached the century mark the tree began to slow down, with an annual growth of one-sixteenth of an inch. So, over

the years, the maple gave of itself, until, in a storm, it was struck by lightning, and was cut down to save the wood. It left its story in the form of its many service stripes, however; left the world its share of sweetness.

Shade trees should frame a house, not smother it, and open space should be left where lawn and flowers will prosper. These two views of the plantings about this home show how privacy has been attained by wise border plantings, and how the house can be set off by wise selection of plants for the foundation.

A Garden Makes a House a Home

By ANDREW S. WING

Photographs from Gottscho-Schleisner

IT HAS truly been said that a house may be just a place to live; it is the garden that makes it a home. Excepting for those who must dwell in crowded city houses, or in apartments, most American families live in detached houses, with land around them. This land is as much a part of the home as the house itself, or should be. Even homes in our largest cities can, and often do, have charming miniature gardens, walled in at the back. There at least a small tree, a few shrubs, flowers, vines or potted plants, and perhaps a tiny pool or fountain help to bring the breath of the open spaces to souls that yearn for beauty.

Unfortunately, too many Americans have planned more wisely for indoor living than for the enjoyment of their outdoor surroundings. Fabulous sums are spent quite casually on modern plumbing, glorified kitchens and period living rooms. If there is anything left, it often goes into a fancy "rumpus" room in the basement. To plan and budget wisely for an appropriate planting of shrubs, trees, lawn and flower borders is the exception rather than the rule. And all too often the result is a bare, unattractive setting for what may be a really beautiful and costly house.

It is never too late, of course, to mend a neglected, unplanned, ailing garden. Time and money will be saved by doing it the right way in the first place, but it is as much fun to do over an old garden as it is to renovate and modernize the interior of a house. And a great deal of the work can be done by the owner and his family, in spare time and without large expenditures for landscape architects and nursery stock. Just as a good architect will usually give you a better house and often save you money at the same time, so a good landscape designer or landscape nurseryman will help you build a more beautiful garden, and in the long run it may not cost you any more.

However, families in moderate circumstances usually decide that they can plan their own home grounds and save money. They shop around for nursery bargains, or buy them from a peddler or a roadside stand. If the result is good, they can consider themselves lucky. Too often the trees and shrubs chosen are of the wrong type. If these live at all, they may soon grow taller than the house, shutting off light and air, or crowding each other into misshapen monstrosities in the border.

One of the commonest mistakes made, even by an experienced gardener—including this one—is to underestimate the size to which a tree, shrub or vine will normally grow. Just because a hemlock, pine or lilac bush is small when you buy it is no reason to believe that it will not be a lusty young giant in five or ten years. Then, if it has been planted close to the house, or in a mass planting elsewhere, you will have the tough job of moving it or cutting it down, unless it is something that can be kept pruned back without utterly destroying its characteristic beauty of foliage and form.

You can learn much from books, bulletins and cata-

logs about the character of plants. Study these carefully and you will avoid mistakes. Ask the advice of gardening friends, or a reliable nurseryman. And do not buy anything just because it is cheap, or because an overstocked tree salesman talks you into it. On small grounds you will not be able to use more than two or three large trees, besides those along the street. The smaller trees, while often slow-growing, are usually finer, anyway. What could be handsomer than a fine dogwood, a flowering crab, a magnolia, or a Japanese cherry in bloom? Many of the dwarf fruit trees will bear good fruit, in addition to offering a profusion of lovely bloom in early spring. Japanese maples, blight-resistant Chinese chestnuts, birch clumps, and the smaller evergreens, such as the hollies and Japanese yews, are suited to the smaller place, and will never grow too large if planted in the right spot. These are all trees worth having on any place, large or small.

Do not worry about not having enough shade. You can have plenty of shade, and protection from the wind, too, without burying your house in a forest. Leave some open spaces where lawn and flowers will grow. Shade trees should frame a house, not smother it. Winter sunshine streaming through the dining room or kitchen windows in early morning is as important as the coolness of shade on a sultry August afternoon — maybe more so. Your vegetable plot should be sunny at least six hours a day, and eight hours of direct sunlight are better for your crops. Grass needs sun, too. Trees should be trimmed up and spaced so that the sun will reach the grass underneath. Maples and poplars are shallow-rooted and rob plants underneath of both plant food and sunshine. Plant them along the borders or street line, but not in the middle of the lawn.

Sometimes a ruthless weeding out of both trees and shrubs is necessary. Many an old homestead would look better, and would be improved in lawn and the important plantings of both shrubbery and flower borders, if the owner had the courage to use his axe on crowded and less desirable specimens. "Spare the axe and spoil the garden" might well be the slogan for such gardeners. In due course trees reach their prime in health, beauty and usefulness. Not to remove them when their day is done is a mistake, love them dearly though you may.

It is an excellent idea to make a plan of your home grounds, be they old or new. Secretary of Agriculture Clinton P. Anderson declared a National Garden Planning Week in February, but it is better late than not at all. Graph paper is best to use, since you can then draw things to scale. But an old piece of wrapping paper or a large piece of laundry cardboard will do. Stand away from your garden and view it as it is, then imagine it as you would like to have it. The same principle applies to an old garden or one that is absolutely new and bare. Compare it with gardens you have seen and liked.

Size and location are important, but not *too* vital. Even if your backyard overlooks the railroad tracks, or is too close to your neighbor's garage or clothesline, there are ways of screening such unsightly objects. Many of the houses in Hollywood and Beverly Hills have small grounds, but Californians have learned the trick of making small outdoor living rooms that provide beauty, privacy and charm. Long vistas are nice, but if you do not have the land you can build an intimate garden where you can entertain friends, and where the cares of the everyday world will be forgotten, at least momentarily. This is not just wishful

A garden pool can usually be worked in, and its construction is fun, calling for some ingenuity and providing exercise.

thinking. I have seen that miracle happen in the tiny walled-in cubicles of New York backyards, where the sun never peeps in except by reflection. Artistry is required, I admit, to achieve these effects; but it is an artistry that can be acquired or borrowed from the good books and garden pictures that are available.

The main thing is the will, for where that exists a way can be found. And it need not cost a fortune, either. In fact, some of the most charming gardens I have known have been built more on dreams and imagination than on experience or fat bank accounts.

The details of a proper garden plan are fairly simple to work out, once the main features have been provided for. You need, of course, walks or drives connecting front entrance with the street, and communicating between service entrance or kitchen door and the garage, terrace, and other main features. These should be as conveniently and practically laid out as possible, without straining for concealment or artistic effects. Sometimes a slight curve will improve the front walk or driveway, but, since the modern trend is to have the house close to the street, there is not much that can be done along this line on a small place.

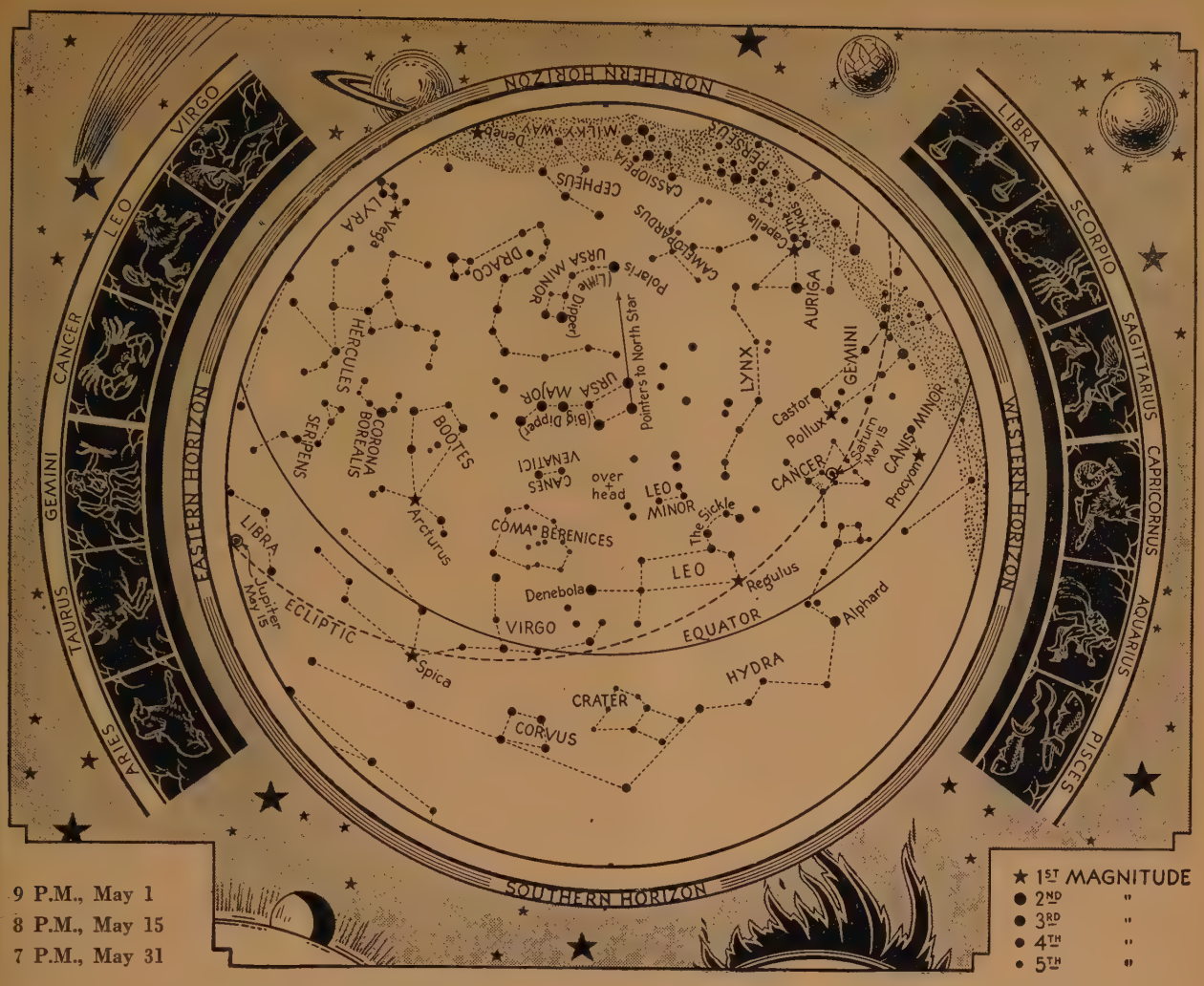
The front yard is your show window, nevertheless, and should be inviting and give your home a gracious and attractive setting. Service areas, such as drying yards and the like, can be concealed with hedges or shrubbery. An attractive foundation planting that is *not* too tall will soften even the severest house, or one with an old-fashioned, high foundation line.

The backyard will usually contain an outdoor living room—which is often a terrace or porch—and the garden proper. A lawn is, of course, essential, and the sunnier it is the better. At the back or on the sides can go the vegetable garden, fruit trees, berry bushes, asparagus bed, and such. These may be hedged in or shielded with tall annuals, perennials, a true hedge, a wall, or low shrubbery. In a corner you may wish to have an outdoor fireplace, and this can well be the heart of your outdoor livingroom, if yours is a family that relishes cooking with a tang of wood smoke in it. Another corner, perhaps near the porch or terrace, can contain a small lily pool. Such may be built and planted at small expense by any handy man or boy.

The whole scheme must hang together, but not necessarily in a formal sense. There should be an axis from the house to the rear of the garden that is clearly accented by some main features, such as a sundial, birdbath, or a rose arbor or path. That is where your plan works in. At right angles there should be another axis, but this is less important.

If you like things geometrical and formal, there is certainly no law against it, but soften your effects with plantings so that your guests will not feel that they are being taken on a tour of Mount Vernon or some formal park laid out many years ago. However, a touch of formality can be worked into any garden, and with charming results. One of the finest gardens I have seen in America consisted of a series of rather small formal beds or gardens, all screened from one another by head-high hedges, and each one was devoted to a particular group of plants or color scheme. The edgings in these gardens along the formal paths were of dwarf boxwood, brick, tile and other interesting materials. And the whole effect was like going from one charming room to another in a beautiful English home. To attain such perfection in an American garden requires skill, taste, infinite patience and means. But it is certainly an effect worth striving for, even if only in a small, informal bed.

Most Americans, however, prefer informality in their outdoor life. A good informal garden requires almost as much skill and knowledge of plant material and design as a formal garden. Plants, however, have a happy habit of blending together and adapting themselves to their surroundings and neighbors, so that the mistakes of the designer are covered up or forgotten. That is one of the most satisfying things about being a gardener; you constantly get surprises, and your efforts often turn out better than expected.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

Eclipse Expeditions

By ISABEL M. LEWIS

THE TOTAL eclipse of the sun, which will occur on May 20, has a long path over land, both in South America and Equatorial Africa. If the eather is favorable it should be one of the best-bserved eclipses on record. The duration of the total hase will be longer than the average. At the position the South Atlantic where the total eclipse will cur with the sun on the meridian, in latitude 1 egree, 58 minutes South, and 24 degrees, 40 minutes est, the sun will be totally eclipsed for 5 minutes d 14 seconds. On the central line on the east coast Brazil near Bahia it will be in total eclipse for ore than four minutes, and about half a minute less the Brazilian Highlands, 300 to 400 miles to the rthwest and north of Rio de Janeiro near Araxa d Bocayuva.

In all there will be nine or more eclipse expedi-ons located in South America for the observation of this eclipse. In Argentina there will be three local groups. One from the National Observatory of Cordoba will be stationed about 50 miles north of Cordoba; one from the La Plata Observatory near Corrientes will occupy two sites; a third will consist of members of an astronomical group known as "Amigos de la Astronomia", under the direction of Dr. B. H. Dawson, and will be located at Itati in northern Argentina. In Brazil the expedition of Brown University-Skyscrapers, under Dr. Charles H. Smiley, will be near Araxa, and the expedition of The National Geographic Society-Army Air Force will be in the vicinity of Bocayuva. There will also be an expedition from London, England, under the direction of Dr. J. A. Carroll, and one from New Zealand, under Dr. C. B. Michie of the New Zealand Astronomical Society. There will be, in addition, two expeditions from Brazil, which have selected sites

near Araxa and Lassance in the path of eclipse.

Modern eclipse observations cover a wide field. They range from accurate observations of the times of beginning and ending of the various phases, for the purpose of testing the agreement between prediction and observation and the accuracy of the tables upon which the predictions are based, to a study of the solar corona, its form, extent, brightness and connection with other types of solar activity. Studies also include the effect of the eclipse upon the earth's atmosphere and radio reception. Photographs and movies of the eclipse in black and white and color are generally obtained, if possible, by all expeditions. A radio broadcast of the eclipse is now a well-established feature of a modern eclipse expedition, and one that was successfully employed at a station in Canada at the time of the total solar eclipse of July 9, 1945.

It is now possible to predict the time of the beginning and ending of the total phase of an eclipse with an uncertainty that should not exceed two or three seconds at the most. A small error in the observer's position, or his time-piece, will make an accurate comparison with the predictions impossible, and it is important to have both position and time accurately known. It is, of course, an advantage to have a number of independent observations of the times of beginning and ending of the total phase of the eclipse from different expeditions. In this way a valuable check on the accuracy of the lunar tables can be obtained. It is known that there are irregularities in the motion of the moon that are not yet accounted for entirely. A small difference found between the predicted and observed time of an eclipse, when all other sources of error are eliminated, will be caused by a small error in the moon's position.

The first scientific expedition sent forth in this country for the observation of a total eclipse of the sun was the one organized at Harvard College to observe the total solar eclipse of October 27, 1780. Unfortunately, either the lunar tables were quite inaccurate, or the position of the observers was poorly known, or some error was made in the prediction, since the expedition did not find itself within the path of total eclipse. Better luck attended the observations made by Nathaniel Bowditch in his own back yard at Salem, Massachusetts, and those of other observers in New York and New England, of the total solar eclipse of June 16, 1806, which had a duration of more than five minutes, and was observed under nearly perfect conditions. It is a strange fact, however, that the splendors of the solar corona received little attention from these early observers. They failed to realize that it was a solar appendage changing in form at different eclipses. Baily's Beads were first observed by the amateur astronomer, Baily, at the time of the annular eclipse of the year 1836, and were soon correctly explained as caused by sunlight shining through depressions or valleys on the irregular limb of the moon at beginning and ending of totality.

Interest in such phenomena as the solar corona prominences, or protuberances, as they were first called, Baily's Beads, and other physical aspects of a total solar eclipse appeared about this time. The magnificent eclipse of July 8, 1842, so widely observed in southern Europe, and especially in Italy, had much to do with stimulating scientific interest in eclipses. Since that day there have been many eclipse expeditions sent from observatories to strange and out of the way places, as well as to well-populated regions to make scientific observations that can be obtained for only a few moments within a narrow path that more often than not passes over inaccessible tracts of land or sea. Yet, even with so few moments afforded for observations, frequently made under discouraging conditions, the results obtained over a period of a hundred years or more have been well worth the time and effort expended in obtaining them.

In the United States many observatories have organized and sent out expeditions for the scientific observation of eclipses. Foremost among these have been the Lick Observatory and the U. S. Naval Observatory. It is at the latter observatory, also, that the predictions on all eclipses are prepared and published by the Nautical Almanac Office. Many an eclipse expedition has been transported to its destination by ships of the U. S. Navy. The expedition to Sumatra in 1901 was taken to Manila by Army transport and from there to Padang by Navy transport. The Navy provided for the transport of Naval Observatory eclipse expeditions to Spain and Algeria in 1905; to Niuafou, or Tin-Can Island, of the Tonga Group in 1930, and, finally, to Canton Island in 1937. This was a tiny atoll in the Pacific uninhabited by man but frequented by birds in great numbers.

The determination to carry on the observations of total solar eclipses under the most discouraging conditions was never better illustrated than at the time of the eclipse of September 21, 1941. This eclipse passed over Russia, Turkestan and a distance of about 5000 miles in China. Although the German invasion of Russia was then advancing at an alarming rate, four Soviet eclipse expeditions carried out their original plans and made valuable (Continued on page 276)

Gift

By ALLEN E. WOODALL

I'm glad you wanted the moon tonight
When I had only the moon to give,
The sky and the clouds were somehow right;
It was enough to be—to live—
Just you and me and the quiet moon.
You won't have to dust the moon, you know,
The north wind comes to brush it soon,
And moon-dust melts like April snow;
I'm glad I thought to give you the moon.

The School Page

Edited by E. LAURENCE PALMER

Professor of Nature and Science Education, Cornell University, and Director of Nature Education, The American Nature Association

SOUND DIARY

MOST DIARIES record primarily the things we see and do. This is an excellent time to start a diary recording the things that we hear. Not only will such a program be somewhat unique, it will also often be challenging, because it is not always easy to put a name to a common sound in Nature. I once knew a farmer who insisted that the sounds of peepers were produced by what he called lizards. He showed me the log that he had turned over and under which he had found a pink lizard," and he said, "the sound stopped just as soon as the log was turned over." I know another farmer in Iowa who told me that there the peeping sounds were made by turtles. He had seen a turtle on a log, and when the turtle went off the log the sound stopped. Those who have had the fun of finding the first real peeper peeping know that both of these farmers were wrong.

While we are speaking of frogs and toads, let us get a brief preview of what our sound diary might include. If we started early enough in the year we would have recorded that we had heard peepers. With them, or shortly after, we probably would have heard the clacking of wood frogs. Then, some day, even when the ice was left in a few spots, we would have heard the grunt of a leopard frog or of a pickerel frog, or the trill of a common toad. Possibly we might have been surprised to hear what we thought was a toad make a noise like a young crow. This would be entirely possible if the toad was a spadefoot instead of a common toad.

While the sounds mentioned so far came, for the most part, from under foot, a short, loud trill may have been heard coming from some common tree toad perched on a nearby branch, possibly some distance above our heads.

As the season advances, many of these sounds may well be replaced by the more profound "chungs" of the green frog, or by the booming "jug-o-rum" of the bull frog. The major identification characters of these animals have been presented earlier in one of our special inserts on the amphibia, so they need not be here elaborated.

True, on until fall, we may hear some of these frogs and toads calling, but rarely will there be the reechoing choruses of the months from April through to July. The time to learn to identify these sounds is when the choruses are at their height, because then you will get repeats after you have made a disturbance. Later in the season, almost anything may be enough to stop a frog or toad from singing.

The amphibian choruses, of course, move northward with the season. While in the North we hardly expect a peeper chorus before mid or late April, I have heard them in full swing in the South in January.

The songs of amphibians are often matched by the songs of breeding birds. At my home, we hear whitethroats and ruby-crowned kinglets at about the same time that we hear the peepers. Great horned owls at their best and northward-moving geese usually antedate the peepers in my sound diary each year. Orioles and pewees and scarlet tanagers do not enter the sound competition until the weather is almost mild enough to bring common toads into full voice. And when some of these more vigorous singers have ceased blowing off their safety valves, and have settled down to vie on the air with the red-eyed vireos, then we may begin to listen for the green frogs and bull frogs. One thing is certain: spring and early summer are the seasons in which the birds and amphibia rule the sound roost. True, a few crickets may enter the picture, and, even before bull frog time, mosquitoes are beginning to do their best to drive us crazy. The time for the real insect chorus is still a long way off, however.

During the summer months, when our birds are molting and resting from the rigors of having reared broods of youngsters, there comes a time when sounds are not so conspicuous as they are before or after. But, by the time school starts in fall, the baton has been passed unquestionably to the insects. It is by the latter part of the warm season that most insects have reached sexual maturity, and that, in most organisms that make any sound at all, is the signal to begin to make themselves heard. Then, the crickets begin by day and the grasshoppers take up the refrain. Long after the bull frogs and green frogs have ceased to be in chorus abundance, the night is taken over by a shift of persistent snowy tree-crickets, followed, only a few weeks before the first frost, by the katydids.

If we happen to live in the right part of the country, where man has not destroyed most of the animals that formerly lived there, a new group might well take over the sound leadership when the insects succumb to the chill of the nights. I think that one of the nicest things about being in national parks such as Yellowstone in late season is the thrill one gets of waking up in the night and hearing elk making their presence known in no uncertain terms. True, our domestic cattle, dogs and cats will moo, howl and yowl at almost any time of the year, but, on me at least, they produce an entirely different effect. One I like to hear and the other I do not.

Merely naming the maker of a sound cannot be wholly satisfying, any more than merely naming the stuffed skin of this or that bird or mammal. Animal sounds are evidence of the activity of a living organism. They are produced, for the most part, for some purpose, or as evidence of an understandable state of maturity or body condition. To a considerable degree, they may be understood and interpreted. Often, they are confusing, and, because of this, inviting to our spirit of investigation.

Let us take, as one way of considering sound, the evident ventriloquism one finds in trying to locate a peeper or a stridulating grasshopper. At one moment, it seems to come from a shrub dead ahead, but, on second thought, you think that it really was off somewhere to the right. Try the stunt of cupping your ears with both hands and swinging your head from side to side. This may help you to define your judgment a bit. Even better, take a hint from the technique used in spotting airplanes by sound, and gang up with some (Continued on page 274)

Thrush in the Apple Tree

By ELLA ELIZABETH PRESTON

You did not see me standing beneath the tree
Watching your lovely throat
Produce each whispered note,
Hearing your fragile song.
Surely I am not wrong;
You practised for the song you meant to bring
Into this flowery spring.
Down through the snowy tree
Floated your tune to me,
Melody pure and true.
You creatures small confirm,
Not bread alone, nor worm,
For living do.

Camera Trails

By EDNA and BILL EVANS

THERE is an old joke about correspondence school graduates gathering around the corner mail box when they want to have a class reunion. That is not exactly true in our case but, more and more, as the "Camera Trails" sections roll out behind us, we have come to regard our mail box as a sort of tin treasure chest.

So many different things come out of our mail box. Of course, some of them—like bills and rejections—are not so much fun. But far outbalancing these on the good side of the ledger are the letters we receive from readers. Letters have been more frequent of late and we hope they will continue that way.

Sometimes letters ask questions that are puzzlers. But such letters offer a definite challenge and finding answers is really enjoyable. We try to answer all letters as promptly as possible and we often wonder what the final outcome on the receiving end will be.

The question asked most frequently is "What kind of a camera shall I buy?" Often, after we have answered this one to the best of our ability, we wonder just what sort of camera actually is purchased. We wish folks would write again and tell us.

Since the letters that come out of the black tin box beside our front door are so interesting to us, we hope other "Camera Trails" readers will be interested in some of the queries, also. For that reason, we are devoting most of this section to questions and answers.

One of the most interesting letters we have received lately (and one which the writer followed up with a second) came from Glenn W. Bell of Atlanta, Ga. He inclosed a photograph, which appears in this section, showing two distinct images of a song sparrow. His question was: "Is it possible at 1/25th of a second to get two images of the same bird on the same negative?"

Our first reaction was to answer "No, what you have is a double exposure." In fact, that is the way we did answer. We even pointed out what we thought was the image taken first. But then we got to thinking about the problem and we were not so sure we were right, after all.

Double exposures happen to the best of photographers. It is quite easy to trip the shutter twice without pulling a new film into position, especially when one has a bird in focus and is in a hurry to "shoot" as many pictures as possible before the elusive model flies away.

As a rule the resulting double exposure is no good at all. Occasionally, however, the result is strikingly unusual. A good many trick shots are double exposures.

More often, however, the twice-exposed negative is too thick to print. The picture sent by Mr. Bell was not over-exposed. That puzzzled us. So, after answering his first letter, we went out and tried some double exposures of our own, using the local swan as subject because it was handy. That result, also, is used as an illustration—or should we say as a "horrible example?"

Study our swan and Mr. Bell's sparrow. The swan was taken with a telephoto lens at f.11 and an exposure time of 1/295th. We held the camera. Mr. Bell reported that his picture was taken at f.8 at 1/25th. He used a portrait lens and his camera was attached to a board. Both pictures were made on verichrome film.

There is a distinct difference in the texture of the two pictures—a difference that cannot entirely be explained away by differences in lenses and cameras. Thus, we were almost ready to reverse our original decision before receiving a second letter and more pictures from Atlanta. In comparison with

This photograph of a song sparrow, taken by Glenn W. Bell of Atlanta, Ga., looks at first glance like a case of double exposure. But further investigation seems to indicate that the bird moved and came to rest again while the shutter was closing. The exposure was made at f.8 at 1/25th. Compare it with the double exposure of the swan. Have other "Camera Trails" readers had results like Mr. Bell's?

pictures from the same roll, the song sparrow negative was no thicker than the others, which showed in turn a pair of towhees, a house sparrow and a cardinal.

Mr. Bell said further, "I thought at first it was a double exposure but after comparing it with other pictures of the series and other double-exposed films I began to doubt its being a double exposure." He took his picture to an "Information, Please" program of the Atlanta Camera Club and submitted the question: "Can it be possible for two distinct images of a bird to be recorded on verichrome film at an exposure of 1/25th at f.8?" He reports that the experts thought a while, then one of them said "Yes," because birds move very rapidly. The final decision in Atlanta was that the song sparrow had been caught in two different poses by the same exposure.

On the basis of our own experiments with doubly-exposed swans, we feel justified in modifying our original decision. After all, birds—especially those with the song sparrow's energy and temperament—do move rapidly. Then, too, 1/25th is not very fast when one remembers that exposures at 1/1000th or faster are sometimes required to "stop" a flying bird's wings.

Apparently the song sparrow was at rest, hopped, and came to rest again in the brief instant that Mr. Bell's shutter was closing. Thus, it was pictured in two poses at almost the same

time. We do not know of any "hopping time" records for song sparrows, but it would seem that here was a bird that nearly succeeded in being in two places at the same time—or should we say it was almost "beside itself?"

It is strange, however, that there is no blur of movement between the two images. Some mechanical quirk in shutter operation might provide a third explanation. We wonder whether any other "Camera Trails" reader has had the same experience that Mr. Bell reports? Frankly, it has never happened to us.

Another question we received from a reader (who did not put a return address on his query) is this: "Is a focal plane shutter at 1/1000th of a second really faster than a compur shutter at 1/400th? That is, would a flying duck be exposed for a shorter time at 1/1000th on focal plane than at 1/400th on compur?"

Perhaps we have missed the point, but it seems to us that this question can be answered by another: "Is a minute recorded on the big clock in the city hall tower any longer than a minute recorded on the smallest of ladies' wrist watches?" After all, there is quite a difference between 1/1000th and 1/400th of a second. In some cases the slower speed might be quite sufficient to "stop" a flying duck and, as the question-writer pointed out, the slower speed would not require such a large lens opening. But, so far as speed itself is concerned, there is quite a difference between 1/400th and 1/1000th.

To return to that oft-asked question: "What kind of a camera shall I buy?" One writer added this to his query: "I'm interested in Nature photography of subjects from bugs to moose. Is there a camera universally good for such a wide range of subjects?"

Now, as we wrote in reply, taking moose pictures and bug portraits requires two entirely different techniques. You can photograph a moose from a considerable distance, in fact, you will be lucky if you get close. A bug, on the other hand, must be photographed at close range. Some cameras can do both kinds of work. Our Graflex, for example, with a telephoto lens for the moose and a double-extension bellows for the bug, will do the trick. But not every camera can.

Since we are not boosting any particular make of camera, we try to picture the writer of each letter (although we do not claim to be handwriting experts) and we keep several things in mind. A lot depends on the age and photographic experience of the person. We would not advise a highly complicated camera for a youngster, nor would we recommend a $1.98-model for a seriously intentioned adult. We realize that everyone cannot afford to spend a small fortune on camera equipment, yet good cameras cost money. Our advice usually boils down to this: "Buy the best camera you can afford, and then learn to operate it in the most efficient manner possible."

Here is our final question: "Why is it that Nature photographers whose pictures appear in magazines never say anything about the cameras and techniques they use? Are these trade secrets and do photographers hesitate to expose them so the market will not be flooded with excellent natural history pictures?"

And the answer: "There are no trade secrets that we know of and the techniques of Nature photography are open to all. It takes patience and practice—plus a fair share of luck—to produce good Nature pictures."

Let your questions come. We will do our best to answer them helpfully and suggest the solutions we know for your photographic problems. And if you have any tips you would like to pass on to others, let us hear these, also.

GADGETS AND THINGS

Now as to another type of material that comes out of our mail box. Here are this month's gleanings:

An international exhibit of biological photography will be held September 10-27 in the Rundel Building of the Rochester, N. Y., public library. The major fields of medicine and natural history will be represented and "Camera Trails" readers in the vicinity of Rochester should find the display of great interest. Readers who might wish to enter pictures in the exhibit can obtain entry blanks from Mr. H. Lou Gibson, 343 State Street, Rochester, 4, N. Y. Closing date for entries is August 1.

For the benefit of camera fans who are thinking of doing their own developing and printing (and who have not done so before) Eastman Kodak Company has recently issued a single package that includes all the materials necessary. Included are a simple contact printer, darkroom lamp, three trays, three packages of developer, one package of fixing powder with hardener, a graduate, stirring rod, thermometer, mask chart, two dozen sheets of paper, and a pair of film clips. This should give beginners a quick and easy plunge into darkroom procedures and techniques.

Eastman also has issued a carrying case for extra filters and lens hoods—this should cut down wear and tear on the accessories themselves and ease the congestion in photographers' pockets. . . . Fedco announces a new adjustable sheet film tank. . . . Kalart reports a new push-button release which is supposed to eliminate fumbling and groping for the cable release. . . . Eastman has a new turn-tilt tripod head. . . . DuPont is completing new facilities for coating photographic paper.

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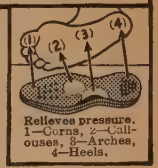

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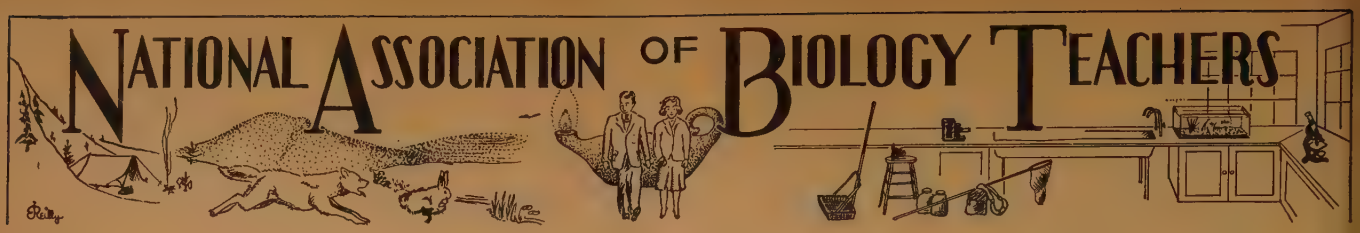

FIRST-AID TO HEALTH EDUCATION IN SCHOOLS

During the initial series of these articles for which the National Association of Biology Teachers is responsible, the varied interests represented in the membership of this organization of teachers will be presented. In this issue, Betty Lockwood, an officer of the organization and a member of the staff in nutrition at Harvard University, presents the case for health education. Further information regarding the N.A.B.T. may be had on inquiry to the secretary, Merle Russell, 403 California Avenue, Royal Oak, Michigan.

One of the few worthwhile results of the recent war was the realization and knowledge that the American people, particularly the teen-agers and the young adults, were not in the pink of condition. First-aid in the form of physical fitness classes, more health education, more ROTC programs, were used to remedy the situation in the schools in 1941. This is 1947! What are the conditions and the facts today? Are these programs still functioning?

When the war ceased, the first-aid gradually ceased in far too many cases. Apparently the need for healthy young men and women no longer existed! It is difficult to explain just why good health is not as important and just as much a right of every American today as during the war. In fact, why is not good health just as important and just as much a right of every American boy and girl as is education? A familiar slogan during the war was "The U. S. Needs US Strong." Does this need no longer exist?

Good health has to be earned. It is no respecter of age or sex, of economic means or vocation. GOOD health accompanies GOOD living, physically, mentally and emotionally. Poor health usually means error on the part of the individual, either through himself from lack of knowledge or from lack of protection, or through carelessness on the part of the community. Every careless or ignorant person means a weak link in the community health chain, whether that person is of school age or is an adult.

When World War II showed the tremendous need of health education by having to reject two persons out of three for disabilities in one form or another, why was not more done to prevent the situation from recurring? Many of these first disabilities could have been prevented through health education in the schools and in the communities. Shall we continue to make the same errors, or shall we do something about this serious condition?

Further proof of the need is presented by a recent statistical study made by the Research Council for Economic Security* showing the definite need for improvement in health conditions and the need for health education over the country as a whole. Every educator should seriously consider this study in terms of what it tells of his own State's conditions and needs. The future of our country is dependent upon improvement within these areas most needing it. Not only is First-aid needed today, but major operations are needed in many places!

Every American child is required by law to attend school until he is 16 years of age. The learning experiences that are given him in that period will aid in determining the type of citizen that he is to be, the contributions that he will make to his own community, as well as determine the value and type of knowledge received. Will these experiences encourage better living, promote better health, provide better citizens? This will depend mainly on the school system. Where health education is sacrificed for so-called facts-of-learning rather than being considered of equal importance and a part of the daily classroom procedures, there will the health education continue to be inadequate. Where administrators and educators are aware of the urgent need, health education can become an integral part of ALL studies, not limited to physical education and science. In this way, health education becomes functional, becomes comprehensive.

Various definitions of health education have been compiled by educators and public health persons. The simplest way of defining its meaning is as that part of the school curriculum which is devoted to the development and improvement of the physical, mental and emotional health of the students. Where should it begin? Since health habits are formed early in life, health education should begin at the nursery-school level, continuing through the elementary school, through the high school and through college. It should be made available for adults and for communities, so that all may have the knowledge and the stimulation for betterment of individual health and American health as a whole. It will be only through a total program like this that our national health picture can be improved.

Many educational groups, because of the paramount importance of health education as a part of the daily curriculum in the lives of all children, are urging that health education be considered as important a part of the school curriculum as the Three R's. The National Association of Biology Teachers is one of these. Several recommendations are necessary to assure a program for better health and for more health education in the schools. The National Association of Biology Teachers recommends: (1) that required courses in health education be offered by teacher-training institutions for all prospective teachers; (2) that inservice courses be offered for those who are now in the teaching field; (3) that yearly physical examinations, including x-rays of the chest, be given to ALL teachers in the field and for those entering the teaching profession. This protects the children as well as the teachers, the community as well as the school; (4) that more efficient and thorough health examinations be given ALL school children; (5) that health education be included within the curriculum wherever and whenever it integrates into the courses of study, regardless of the subject.

It will be only by concentrated effort on the part of ALL teachers and ALL schools throughout the country that the health standards and conditions of school children will be improved. How can we set ourselves up as criteria for a healthy nation when 24 of our 48 States show a poor or bad rating for health education, sanitation, recreation, housing, economic conditions and hygienic practices? ** Why look across the oceans to aid health standards, ignoring our own, when our own peoples urgently need help and attention?

Look critically at your own school system and its curriculum. Does the health education need First-aid? If so, who will provide the initiative needed for that first step towards better health education for students and teachers? In other words, where are the doctors?

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* Statistical Study by Gerhard Hirschfeld, Director, and Carl W. Strow, Associate Director, Research Council for Economic Security, Chicago, Ill.

** Article "Our National Health Problem", Practical Home Economics, Feb., 1947 is based on this statistical study.

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ORCHIDS ARE WHERE YOU FIND THEM

(Continued from page 236)

happy. It was not their fault that half the plants had bad spots inside the pseudobulbs, spots that were unseen until the plant inspector broke them open for examination. He then announced they must be destroyed. Nor was it the Mérida family's fault that most of the survivors were the wrong species. And, of course, nobody could be blamed when the maritime strike came along and tied up shipment so long that the plants died en route. Truly, orchids are where you find them, and even when you find them, you may not get them home safely.

The day of the jungle orchid collector is nearly over. In fact, its sun has already set. Venezuela has passed regulations prohibiting the export of plants, except through certain favored dealers. Colombia is soon expected to follow suit. Whether the move is to protect what still remains of the wild orchids or to hand the export business to a favored few is beside the point. The regulations exist, and that is that.

Of course there will always be collectors, who will follow the orchid will-o'-the-wisp as long as there are jungles left. They will search for those two mythical species, the "all-white" orchid and the "pure black" one. Some will actually search; others will confine their seeking to the interior of *cantinas*.

Actually, there are a number of white orchids, some non-commercial and some large enough for corsage use. Most of them have a touch of gold or a streak of lavender in the lip, but not enough color to detract from their use in wedding bouquets. The so-called "black" orchid would not be black at all, but rather a deep purple. If such exists, it may be found some day. But the chances are even greater that some grower eventually will develop such a flower without ever leaving his steam-heated greenhouse.

So far as rarity is concerned, the blue orchid is much more so than the white one. In all the vast orchid family, only one—the *Vanda coerulea*—produces a blue flower. This plant, a native of India, is not especially rare, but it brings a good price on the market, and so do its blossoms.

There are many wrong ideas current about orchids. In the first place, they are not all denizens of steaming tropical jungles. Instead, many of the best commercial ones grow on the mountainsides, thousands of feet above sea level. Nor are they particularly fragile, for the uncut blossoms will remain fresh on the plant for weeks at a time. The plants will readily survive a two-month waterless and foodless shipping period.

Then why, someone may ask, since orchids are so hardy and have been collected so extensively, why are they so expensive? Because, first of all, collecting is expensive. Second, because, once collected and shipped to this country, they must be pampered rather extensively—warmed and watered, rested or pushed, and all in the proper seasons.

Orchids grown from seed, be they straight species or hybrids, require even more care. The plants are prolific seed-producers and a single pod will contain thousands of seeds no bigger than a grain of dust. But, because of their very abundance, only a few of those seeds are intended to germinate. In the natural state, only one in many thousands would ever alight in hospitable territory and produce a new plant.

In "captivity" orchid seeds are grown in flasks, on a carefully prepared and sterilized agar medium. They grow in their bottles for about a year and then the plantlets are removed and placed in community pots for another year. After that each plant is given a small pot of its own and every year thereafter is moved to larger quarters. Finally, after about eight moves, the orchid plant is large enough to bloom for the first time. Thus, it is eight years from seed to corsage producer. No wonder orchids are expensive.

All orchids are not "air plants"—fully half of them are terrestrial, that is, they grow in the ground. The epiphytic kinds, those that grow on trees, are not parasites, for they take no nourishment from their hosts and do no harm to them.

Probably, from the collector's standpoint, there is more future in the terrestrial orchid than there is in the epiphytic kind. More work has been done with the epiphytes because they are the ones with the big, showy blossoms. The terrestrials, with their smaller, more conservative flowers, have been left to blush and bloom unnoticed.

We found a whole mountainside in Venezuela that was thickly covered with *Sobralia* plants. Sobralias are terrestrial orchids, beautiful while they last, but, alas, the flower fades after blooming for a single day. We found sobralias in Mexico, too, and bought the flowers in perishable boxes made from hollowed-out banana stalks. But sobralias leave the commercial florist cold; he wants something more lasting than this in his business.

So dreams of collecting orchids in the South American jungles, or even of seeing them grow wild in spectacular abundance, may be fancies difficult to transform into reality. Orchids, like gold, are where you find them. And finding them nowadays is not easy.

More Salmon

In short domestic supply during the war years, salmon will be plentiful in fresh and frozen form in 1947, says the U. S. Fish and Wildlife Service.

THE SCHOOL PAGE

(Continued from page 269)

friend who, from some distance, tries to locate the sound that interests you. If each of you points towards what you think is the source of the sound, you may come nearer the actual location than if you work independently. As a matter of fact, in this way you are using the triangulation technique.

Sounds are significant in a broader sense, too. Not only are there sounds that are typical of the swamp, forest and meadow of your own community, but there are those that tell us you are hearing a western species, or one from the East, North or South. This is where the sound movies give some of us fun. When you hear a southern frog or a western meadowlark adding "atmosphere" to a night or day in New England, you know that somebody slipped somewhere. Should you take a trip this summer, see if you can detect any of the niceties characteristic of the place you may be.

An understanding of the sounds of Nature not only helps you appreciate the calendar and the map of Nature, but it adds to your appreciation of the organisms that make and receive sound. If you investigate you will find that some organisms make the sound with vocal cords, some with wings, some with feet, some with legs, and so on. Even more interesting, we find some having their sound receiving organs on their heads, bodies, elbows, thighs and so on. No place seems impossible as a source of sound production or reception, if we look at the animal kingdom as a whole.

Of course, we are all intrigued by the fact that the limitations of our own ears keep us ignorant of much that goes on. We can hear some of the sounds of bats and fishes but we have mechanical evidence that we miss probably about as much as we get. We have only scratched the surface as yet, and the future in this field of investigation may be as surprising as has been the immediate past.

And after we have gained a reasonable mastery of the recognition of sounds, usual and unusual, and after we have placed them in the realms of time and locality, we still have not begun the most interesting of explorations. What does any sound we hear really mean? The psychologists may step in and help us here, and they may bring us back to earth with a dull and sickening thud. What we may think of as a love song issuing from the bill of a beautiful bird may in essence be a string of epithets hurled in defiance at a rival male. We think we can read fear, invitation, boredom and so on into the sounds we hear, but are we sure? What evidence do we have to support our views? Do our friends agree with us, and do we agree with the judgment of others? When you get all of these things into your diary of sounds I would appreciate a peek into it.

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FROM SWAMP TO SWANK

(Continued from page 240)

their prey; they capture it by a process of watchful waiting. A typical hunting attitude finds the alligator under water with only the eyes protruding above the surface. Pigeons flying too low over the pools at the St. Augustine alligator farm have been seen to disappear in a lightning snap of the jaws of the apparent sleeper.

Hungry alligators prefer the shade; well-fed alligators bask in the sun, the heat helping digest their food.

Although somewhat similar in appearance, alligators recognize crocodiles as a different species. In many decades of observation, no crocodile has been known to mate with an alligator.

There is no such creature as a trained alligator. The dime-size brain operates by instinct only. Such stunts as ramp climbing are accomplished when the beast is slapped on the tail with a shovel; fear pushes him up the ramp.

The tail is not the most dangerous part of the alligator. The cavernous mouth, which has a measured jaw pressure of nearly 1000 pounds in the larger specimens, *is* dangerous.

Alligators will not attack what they do not intend to eat. Crocodiles will snap and reconsider. Alligators snap and clamp tenaciously. They are not more docile than crocodiles, but are every bit as ferocious, lacking only the crocodile's aggressiveness.

The alligator prefers fresh water, but has been known to inhabit salt water. Alligators swim salt rivers, and, in confusion, have even gone swimming out to sea. At the St. Augustine alligator farm they live in sulphur water, common to many Florida pools and streams.

Although the alligator has ears under two flaps behind the eyes, it is more sensitive to tremors in the ground than to audible sound. Resting alligators often rest the lower jaws on the ground. This is supposed to function as a sort of "alligator radar" to detect anything approaching.

Civilization has not changed the original habits of the alligator, but has called attention to some of them. Swamp 'gators bellow during thunderstorms in a full-throated, lion-like roar. A shotgun fired on the farm causes a symphonic bellow that shakes the concrete buildings. A few years ago the Governor of Florida came to St. Augustine and was greeted with a multi-gun salute. The 'gators bellowed all that afternoon. Then, during the war, the Coast Guard manned a target range within smell of gunsmoke from the alligator farm. Remarks Usina: "The Hooligans nearly wore out our 'gators; the poor old things bellowed incessantly for days on end."

We have cited known information now available on the subject of alligators. Certain other facts remain still to be revealed, but students of the animals are faced with problems that can not be solved in a human lifetime. Guinea pigs are excellent research animals because they produce many generations in a short period, but alligators, from those tagged and recorded (a very few), blink blandly at more than one generation of human beings, living seldom less than one hundred years. Some alligators now living are reputed to be nearly 1000 years old, but no concrete proof of their age exists.

Because the study of these scaly Methuselahs has begun in earnest only in the past fifty years, it may be another half century, or more, before one can draw definite, water-tight conclusions as to their development.

In the meanwhile in St. Augustine, Florida, the alligator farmers continue to feed their 6000 captives and to compile valuable information for the zoology students of the next century.

ECLIPSE EXPEDITIONS

(Continued from page 268)

scientific observations, which have since been published. Weather conditions were perfect at the chosen sites. A group of Chinese astronomers under Dr. Y. C. Chang, realizing that unless they made efforts to observe this eclipse scientifically it might be unrecorded throughout its great length in China, underwent great hardships to get within the path. Their 160-day round trip was made in an open Government truck over a motor road under constant bombardment and strewn with the wrecks of cars and trucks. Boxes of instruments, bedding and baggage were transported from Kunming, Yunnan, to the vicinity of Lintao, Kansu, over this hazardous road and through torrential downpours along the upper Yangtze, and under the blazing sun of the Tibetan plateau. The observers were rewarded with perfect weather and a scientific program was successfully completed. As it happened a ship of the U. S. Navy, the *U. S. S. Wake* of the Yangtze Patrol, was stationed, at the time of the eclipse, at Hankow, directly in the path. The duration of totality at Hankow was observed to be 183 seconds. The position at which the observations were made was recorded, and the times of beginning and ending of the total phase and other data were forwarded to the Naval Observatory by the commander of the flag-ship *Luzon* of the Yangtze Patrol. On December 8, 1941, the *U. S. S. Wake* was captured by the Japanese at Shanghai.

Partial phases of the eclipse of May 20 will be seen over all of South America—except parts of Ecuador, Colombia, and Venezuela—the Atlantic Ocean between South America and Africa, and all of Africa except the northern tip of Tunisia.

Mercury will be within several degrees of the sun at the time of the total eclipse. It will be in superior conjunction with the sun on May 15, and by the end of May will be visible above the western horizon shortly after sunset. Venus will be low in the east before sunrise during the month. Mars now rises about two hours before the sun, but will be difficult to observe, as it is fainter than a star of first magnitude. It will be in conjunction with Venus on May 17. Jupiter is now in fine position for observation, and will be in opposition to the sun on May 14. Saturn is now west of the meridian at sunset and sets before midnight. It is in the constellation of Cancer.

THE TOAD AND ITS TONGUE

(Continued from page 243)

The still pictures, and those of the toad at the bath, were taken with the flash synchronized with the camera shutter in the ordinary way. There was motion in all of these pictures, but no appearance of motion, on account of the speed of the flash.

Did the electrical contact give the feeding toad a shock? Yes, but only a little one, which she did not seem to mind in the least. Perhaps it was like a relish; a dash of pepper or mustard. The tongue pictures bring out an interesting point. The toad's tongue is in effect prehensile. It laps down, not up, flicking over the bait and around it with a grasping motion.

PIONEERING AT CHICAGO'S ZOO

(Continued from page 260)

a hairy tarantula beneath a ten-power glass!

Curator Snedigar wants to exhibit marine invertebrates to compensate for the shortage of local insects in the winter. When adequate salt water can be obtained, sea urchins, starfish, crabs, and mollusks will be displayed.

Weird and striking tropical insects would add a cosmopolitan note to the unusual new house. Here, again, availability is the big problem. Many of the most unusual tropical insects are barred from live importation into the United States because of the chance that they might escape and thrive in an environment without natural controls. A colony of parasol ants would make a spectacular exhibit. These large ants forage through South American jungles, cutting up leaves and carrying the fragments over their backs like umbrellas. Tropical butterflies, spiders, bees, and ants provide an immense unexplored potential for future exhibits.

Snedigar and Bean set a precedent in zoological exhibition that has called public attention to the fascinating invertebrate world. They have been pioneering at the Chicago Zoological Park.

Wanted: More Honeybees

More and more honeybees are urged by the U. S. Department of Agriculture. The increasing use of more powerful insecticides is seriously affecting the population of bumblebees, solitary bees and other pollinating insects. Increased attention to clean cultivation of crops and orchards is also complicating the situation. Harold J. Clay, honey marketing specialist, says: "Both these practices have destroyed the homes and prevented the natural increase of countless millions of earth-dwelling insects that played an important part in the pollination of fruits, vegetables and field crops." This situation bears out our early warnings about the impact of unrestricted use of DDT. It is another example of man's meddling with Nature's scheme.

Roadside Improvement

County and town zoning as the most effective means of controlling roadside conditions comes in for careful consideration and analysis in the most recent issue of *The Roadside Bulletin* of the National Roadside Council, 119 East 19th Street, New York 3, New York. The manner in which county zoning has worked in many parts of the country is discussed as a guide to other regions. At the same time the National Roadside Council issues a valuable "Selected Bibliography for Highway and Roadside Planners," listing a useful group of titles on a variety of subjects related to roadside control.

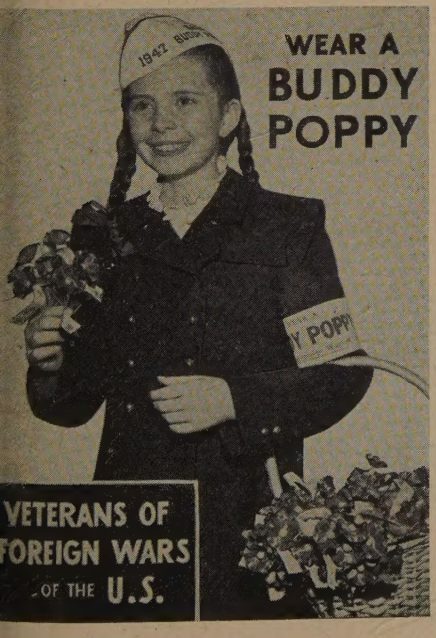
ANSWERS TO QUIZ

(a) Plant eaters: beaver, jack rabbit, moose, porcupine, woodchuck, bighorn.

(b) Insect eaters: hedgehog, mole.

(c) Flesh eaters: badger, lynx, mink, weasel.

(d) Eaters of both animal and vegetable food: gray fox, opossum, raccoon, skunk.



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Under the Microscope

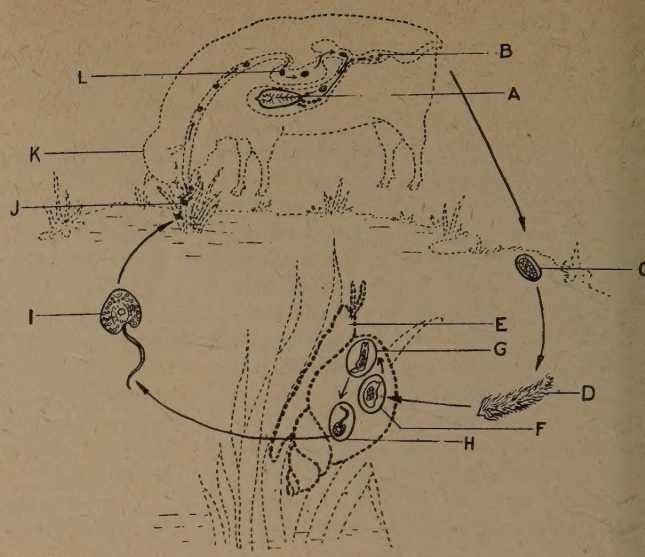
By JULIAN D. CORRINGTON

FLUKE LARVAE

FROM his exalted position at the pinnacle of the animate world, man is pardonably certain that he is the most complex of all living things. So he is, when we consider his enormously augmented nervous system, regulation through internal secretions, and highly involved patterns of behavior. Comparative studies from certain other points of view, however, dispel this motion of universal superiority. The horse is more precisely specialized, being far better adapted to a particular way of life; such insects as ants reach a plane of social organization impossible of attainment by an individualistic species like man; and the higher insects—those with a complete metamorphosis—show a much more diversified life cycle than does any vertebrate, even man. The familiar example of the butterfly, that divides the two great life necessities into two completely different kinds of animals—the crawling caterpillar that eats and grows, and the winged sprite that reproduces—with a reconstruction stage in between, the chrysalis or pupa, appeals to anyone as a far more wonderful story than the relatively simple sequence of events in human embryology.

Yet even the butterfly life cycle is a child's primer compared to the complexities in the careers of animals far down in the scale of organization, the flukes and tapeworms of the Phylum Platyhelminthes, or Flatworms. Correlated with the most intricate of all life histories, these worms, much simpler than man or insects in other respects, exhibit an amazing degree of elaboration in the anatomy of the reproductive system, far outstripping all other animals in this regard. Details of this system will form the subject of a future discussion.

Comparison of an adult free-living flatworm, such as *Planaria,* with a liver fluke, as *Fasciola,* will set the stage for an understanding of some of the chief problems that face an internal parasite. The planarian must have well-developed nervous and muscular systems for active locomotion, and sense organs to detect both food and enemies. The fluke passes its adult life safely housed in some internal organ, such as the liver, and, while it retains some vestige of locomotive ability, needs to move about but little. Surrounded by food, no sense organs are necessary, and digestive and distributional requirements are simplified. On the other hand, two essentials must be stressed if success in this peculiar business is to be achieved: organs of attachment to the host, and an extremely prolific reproductive system. A generalized account of life cycles was given in our article on frog flukes in the issue for May, 1940, where



Life history of sheep liver fluke.

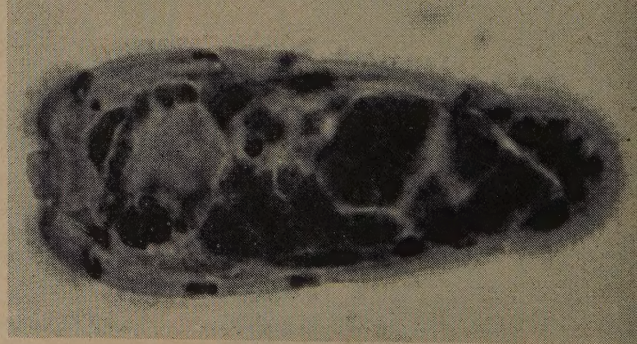
adults were figured. The present narration deals with larva stages.

For many years the classic example discussed in texts o general biology and zoology has been the European Sheep Live Fluke, *Fasciola hepatica,* which has for some time been estab lished in numerous areas of the United States. Adults infest th bile and hepatic ducts of sheep and occasionally pigs, cow other mammals, and man; if present in any considerabl numbers they cause liver rot, often terminating fatally.

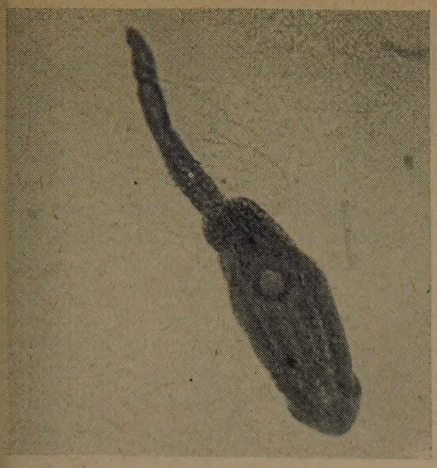
As may be followed in the accompanying diagram of the lif cycle, the *adult fluke (A)* produces fertilized *eggs (B)* whic pass out of the bile duct, enter the intestine, and leave th sheep in its droppings. Those eggs that happen to fall int water, as a stream or at least a marshy situation, develo *embryos (C),* each hatching into a *miracidium (D),* a fre swimming larva. This tiny creature must find one of a limite number of species of fresh-water *snails (E)* within a maximu limit of eight hours, or it will perish. The snail most commonl used as an *intermediate host* in north temperate regions *Lymnæa truncatula,* though species of as many as nine gener have been listed as serving this usage. Successful miracidi bore or digest their way into tissues of the snail, coming to re in the lymph channels of the liver, at the apex of the spire o the shell, and there change their form to that of an elongat sac, the *sporocyst (F).*

Germ cells that were present in the miracidium now begi to develop into a second type of larva, the *redia (G),* th sporocyst acting as a brood chamber. Approaching maturit the rediae burst the sporocyst wall and escape into the host tissues. Each then produces another generation of daughte rediae, and these in turn give rise to a third larval type, th cercaria *(H).* This animal, with a heart-shaped body and lon tadpole-like tail, erupts from the snail and becomes free-swin ming *(I)* for a few hours. If possible, it then encysts, usuall

Redia magnified 50X, showing daughter cercariae.



Miracidium, *Fasciola hepatica,* magnified 500X



Cercaria, 100X.

on aquatic vegetation, as grass blades or watercress, losing the tail and secreting a wall about itself, being then termed a *metacercaria (J)*. Such of these as happen to be eaten by a *sheep (K)*, the *final host*, are swallowed and pass to the duodenum, where they *excyst (L)* as *young flukes* and penetrate the intestine wall, migrate through the body cavity to the liver, and puncture this organ in order to reach eventually the bile passages after some seven or eight weeks. Here they mature and begin the production of fertilized eggs, completing the cycle.

The reasons behind the great amount of complexity in this life history are more interesting than the stages themselves, and the manner in which such a highly involved mode of life could have evolved is more interesting still.

Most sheep pastures in the more fertile spots of the world have a stream flowing through them, or at least a tract of marshy land. Most such areas of water will be inhabited by aquatic snails. Both water and snails are essential for the presence of endemic liver fluke disease, technically designated by suffixing *iasis* to the name of the genus of the worm pathogen, in this case *fascioliasis hepatica*. Inasmuch as the miracidia are microscopic and are so constructed as to be unable to take food, they must find the particular snail host within a very limited extent of time or they perish. Obviously, the great majority are destined to fail, but this contingency is taken care of by the enormous fecundity of the adults, some of which have been recorded as passing as many as 25,000 fertile eggs per day! Most eggs will not fall into a situation sufficiently moist as to permit development of embryos; most of the relatively small number of miracidia that do result from the great array of eggs will not find the right snail soon enough; but at least a few out of all the millions of eggs produced will survive the hazards of this expedition into the outer world.

Inside the snail, a second reproductive period now occurs, in preparation for a second journey. Each sporocyst gives rise to a large number of rediae, each redia in turn to a multitude of daughter rediae and, finally, each of these into a host of cercariae, often throughout a considerable period of time. Each miracidium is thus the great-grandparent of many cercariae, usually numbered in the hundreds of thousands. These cercariae doubtless suffer depletion through accident or ingestion by small water animals, but their greatest mortality must occur simply from the chance that most will never be eaten by a final host. There are thus two great periods of hazard in the life cycle, both of them free-living, and hazardous mainly from the standpoint that the great majority will never complete the cycle. As an adaptation for these two contingencies, each journey outside the safe harborage of a host's body is preceded by a stage of vast multiplication, so that a few may survive. This is certainly a most prodigal way of life, but it is none the less successful. Flukes, like the poor, we have always with us.

Classically, this life story has been singled out as a striking instance of *metagenesis*, or alternation of generations; a larval period reproducing asexually alternating with an adult stage reproducing sexually. More recently, however, many investigators have thought of the production of rediae and cercariae as a sexual process, either parthenogenetic (virgin birth, or the production of offspring from unfertilized eggs), polyembryonic (multiple births, as in twinning), or bisexual, with such a conflict of insufficient evidence that the matter is at present in an unsatisfactory and indeterminable condition. The germ cells of the miracidium become germ balls, but the exact way in which these originate and develop is disputed.

The miracidium ("little boy") is ciliated and has a short, primitive gut at the anterior end, where also are found one or more pairs of lytic or penetration glands. Some have red eyespots, sensitive to light; others are "blind." A primitive nervous system is present, likewise one or more pairs of flame cells and excretory tubules, the pattern of which is valuable for use in classification. Most of the interior of this minute creature is occupied by germ cells.

When the miracidium changes to a sporocyst inside the snail, it becomes a mature, reproductive individual. Gone are the cilia, glands, eyespots, primitive gut and other adaptive or reminiscent structures, and all that is left is the body wall itself, forming a sac, housing the germ cells, which now develop into germ balls and then into rediae. The sporocyst can absorb food and give off waste through its body wall, but eventually dies when ruptured by the fully formed rediae.

The name of this next larval stage commemorates a celebrated Italian poet and naturalist, Francesco Redi (1626?-1697). These animals have a mouth, muscular

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pharynx, and short blind gut or caecum, a more elaborate arrangement of flame cells and excretory tubules than was present in the parent miracidium, and may or may not exhibit a pair of short appendages and a birth pore for the escape of progeny. As before, most of the space within the body wall is taken up with offspring, daughter rediae developing from germ balls located at the rear.

Cercariae are much more like adult flukes than are any of the larvae. This is to be expected, since the cercariae become adult flukes, after transfer to the final host. They have both oral and ventral suckers, a digestive system like that of the adult, though simpler, and a still more complicated excretory system than that of the redia. As special adaptive features for its own career, a cercaria possesses a swimming tail and two kinds of glands located near the oral sucker. One type produces dissolving secretions so that the parasite may bore its way into tissues of the next host, as is true of the Chinese Human Liver Fluke, *Clonorchis sinensis;* the other sort of gland cell provides a secretion that makes a cyst wall around the cercaria, as in *Fasciola.* Most animals expend much of their time and energy in the endless struggle for existence, the object of the game being to escape serving as food for some predator. Astonishingly enough, the cercaria must be eaten in order to live!

Many are the variations in structure of the several types of fluke larvae, and many the weird deviations from the foregoing life cycle. Omitting primitive flukes that show no alternation of generations, all others fall within the Subclass Digenea, and these exhibit alternation of hosts as well as of generations. They all parasitize mollusks in one of their larval phases, and vertebrates as adults. A few are even trigenetic, with three hosts, as *Clonorchis.* In this serious Oriental pest the adult fluke lays eggs containing miracidia, which hatch only when eaten by a snail; the miracidium develops into a sporocyst, which produces rediae, and these in turn—only one generation of them this time—give rise to cercariae. These attack fish and encyst as metacercariae in the flesh which, if eaten raw by cat, dog, or man, develop into mature flukes. Thus there are two intermediate hosts, snail and fish, in this complicated life cycle.

Blood flukes, of the genus *Schistosoma,* the three chief species of which infest man in tropical countries, differ most markedly from the typical flukes in construction and life history. They are bisexual, the eggs are spined and contain developed embryos when laid, the miracidia attack and penetrate snails, and become sporocysts, as in *Fasciola,* but these then produce a second generation of sporocysts, which give birth to cercariae, the redia stage being omitted. The cercariae attack and penetrate the final host, and do not encyst. Strange, indeed, are the ways of flukes, low in the scale of organization, but most highly evolved of all animals in matters pertaining to life cycles.

ADVANCED HINTS

Specimens of larval flukes are not particularly difficult to secure and prepare as whole mounts of more than ordinary interest. Usually it will not be possible to identify the species or to connect such larvae with a particular species of adult fluke, since the life cycles of large numbers of these parasites that affect animals other than man and his domesticated stock are mostly unknown. There has been no medical or commercial impetus to motivate such researches. Though unidentified, larval stages of flukes are none the less worth mounting and study.

The snails to be secured are any of numerous species of fresh-water gastropods. Since they come to the surface to breathe air, using a specialized portion of the mantle cavity as a lung, they are called pulmonate snails, in distinction from the branchiate species, found in marine waters, that employ gills for respiration.

Collect a dozen or so fresh-water snails and prepare a cylinder of water, completely filled, and allow to stand exposed several days, or boil, to drive off dissolved air. When stale or cool, place the snails in the water and cover the container with a glass plate, the water being flush with the surface and contacting the plate. Unable to obtain oxygen, the snails soon are asphyxiated, and die in an extended condition. Crack the shells with a hammer and remove the soft parts to a watch glass of water, dissecting to isolate the liver and lung. Search these organs with a hand lens for sporocysts, rediae, and immature cercariae. Not all snails are infected, so it may be necessary to try several specimens, or snails from different localities and of different species, before meeting with success.

With a pipette, transfer any larval flukes encountered to a watch glass of 10% formalin, fixing for thirty minutes, then stain with any of several dyes, destain if necessary, dehydrate through the alcohol series or with two changes of cellosolve, counterstain if desired, complete dehydration in absolute alcohol or cellosolve, clear in xylol, and mount in balsam or synthetic mountant. Place about half-a-dozen specimens on one slide, spaced apart; preferably half of them stained with one color, half with another; mixed larvae on one slide or separate slides for the several stages, as preferred.

Recommended stains include borax carmine, basic fuchsin, safranin, crystal violet, and orange G. Rediae and cercariae can be double-stained with safranin and fast green FCF. Mayer's hemalum gives very brilliant results.

Cercariae removed from a snail are not completely mature. To obtain fully developed cercariae, keep snails alive for a few days in a vessel of water. Infected individuals will discharge these larvae, which are large enough to be seen with the unaided eye, as they swim about in the water or crawl along the bottom. The number escaping in a single day may run into the thousands.

Microtechnique The advanced student of microtechnique will be much interested by a small volume that packs a world of useful information, by an outstanding authority. *Microscopic Technique in Biology and Medicine,* by Professor E. V. Cowdry, is a reference work for the cytological, histological, and microchemical investigator that is quite unique. An introduction calls attention to fifteen distinct choices of method in attacking a problem, with examples of each. Then follows the body of the material, arranged alphabetically and in two columns per page, like a dictionary, a scheme that greatly facilitates finding the wanted information.

One student may think of looking up a procedure by name of structure, as nerve fibers, Golgi apparatus, spleen. Another might seek microchemical information, and turn to such entries as lead or hydrochloric acid; or for enzymes, as pepsin. The histologist will generally seek methods according to name of reagent, as cellosolve, fast green FCF, or by name of discoverer, as Gram or Wright. Here will be found an explanation of rickettsia, radioactive isotopes, or the quartz rod technique for illuminating living organs, as well as the more commonplace procedures of fixation or micro-injection, or definitions of such terms as micron or cartilage. Hundreds of items are covered, cross-referenced, with synonyms and, of particular value in research, citations to the literature, placed right with the subject, where it is wanted, and not in a bibliography at the end. The style is clipped and terse, admirably suited to the nature of the volume, and gives definite information on specific subjects. Pp. iv, 206. The Williams & Wilkins Co., Mt. Royal & Guilford Aves., Baltimore 2, 1943. $4.00.